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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/069,790 ✓	07/26/2002	Sigrid Hertelt	449122024700 ✓	5002

25227 7590 01/11/2007
MORRISON & FOERSTER LLP
1650 TYSONS BOULEVARD
SUITE 300
MCLEAN, VA 22102

EXAMINER	
NGUYEN, QUYNH H	

ART UNIT	PAPER NUMBER
2614	

MAIL DATE	DELIVERY MODE
01/11/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

DOCKETED Ntc Appeal Due
REMINDER: 2-11-07 (Re-Set)
FINAL DUE DATE: 4-25-07

Advisory Action Before the Filing of an Appeal Brief	Application No.	Applicant(s)	
	10/069,790	HERTELT ET AL.	
	Examiner	Art Unit	
	Quynh H. Nguyen	2614	

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

THE REPLY FILED 20 December 2006 FAILS TO PLACE THIS APPLICATION IN CONDITION FOR ALLOWANCE.

1. ☐ The reply was filed after a final rejection, but prior to or on the same day as filing a Notice of Appeal. To avoid abandonment of this application, applicant must timely file one of the following replies: (1) an amendment, affidavit, or other evidence, which places the application in condition for allowance; (2) a Notice of Appeal (with appeal fee) in compliance with 37 CFR 41.31; or (3) a Request for Continued Examination (RCE) in compliance with 37 CFR 1.114. The reply must be filed within one of the following time periods:

   a) ☐ The period for reply expires _____ months from the mailing date of the final rejection.

   b) ☒ The period for reply expires on: (1) the mailing date of this Advisory Action, or (2) the date set forth in the final rejection, whichever is later. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of the final rejection.

   Examiner Note: If box 1 is checked, check either box (a) or (b). ONLY CHECK BOX (b) WHEN THE FIRST REPLY WAS FILED WITHIN TWO MONTHS OF THE FINAL REJECTION. See MPEP 706.07(f).

Extensions of time may be obtained under 37 CFR 1.136(a). The date on which the petition under 37 CFR 1.136(a) and the appropriate extension fee have been filed is the date for purposes of determining the period of extension and the corresponding amount of the fee. The appropriate extension fee under 37 CFR 1.17(a) is calculated from: (1) the expiration date of the shortened statutory period for reply originally set in the final Office action; or (2) as set forth in (b) above, if checked. Any reply received by the Office later than three months after the mailing date of the final rejection, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

NOTICE OF APPEAL

2. ☐ The Notice of Appeal was filed on _____. A brief in compliance with 37 CFR 41.37 must be filed within two months of the date of filing the Notice of Appeal (37 CFR 41.37(a)), or any extension thereof (37 CFR 41.37(e)), to avoid dismissal of the appeal. Since a Notice of Appeal has been filed, any reply must be filed within the time period set forth in 37 CFR 41.37(a).

AMENDMENTS

3. ☐ The proposed amendment(s) filed after a final rejection, but prior to the date of filing a brief, will not be entered because
   (a) ☐ They raise new issues that would require further consideration and/or search (see NOTE below);
   (b) ☐ They raise the issue of new matter (see NOTE below);
   (c) ☐ They are not deemed to place the application in better form for appeal by materially reducing or simplifying the issues for appeal; and/or
   (d) ☐ They present additional claims without canceling a corresponding number of finally rejected claims.

   NOTE: _____. (See 37 CFR 1.116 and 41.33(a)).

4. ☐ The amendments are not in compliance with 37 CFR 1.121. See attached Notice of Non-Compliant Amendment (PTOL-324).

5. ☐ Applicant's reply has overcome the following rejection(s): _____.

6. ☐ Newly proposed or amended claim(s) _____ would be allowable if submitted in a separate, timely filed amendment canceling the non-allowable claim(s).

7. ☒ For purposes of appeal, the proposed amendment(s): a) ☐ will not be entered, or b) ☒ will be entered and an explanation of how the new or amended claims would be rejected is provided below or appended.
   The status of the claim(s) is (or will be) as follows:
   Claim(s) allowed: *None*.
   Claim(s) objected to: *None*.
   Claim(s) rejected: *1-11*.
   Claim(s) withdrawn from consideration: *None*.

AFFIDAVIT OR OTHER EVIDENCE

8. ☐ The affidavit or other evidence filed after a final action, but before or on the date of filing a Notice of Appeal will not be entered because applicant failed to provide a showing of good and sufficient reasons why the affidavit or other evidence is necessary and was not earlier presented. See 37 CFR 1.116(e).

9. ☐ The affidavit or other evidence filed after the date of filing a Notice of Appeal, but prior to the date of filing a brief, will not be entered because the affidavit or other evidence failed to overcome all rejections under appeal and/or appellant fails to provide a showing a good and sufficient reasons why it is necessary and was not earlier presented. See 37 CFR 41.33(d)(1).

10. ☐ The affidavit or other evidence is entered. An explanation of the status of the claims after entry is below or attached.

REQUEST FOR RECONSIDERATION/OTHER

11. ☒ The request for reconsideration has been considered but does NOT place the application in condition for allowance because: See Continuation Sheet.

12. ☐ Note the attached Information Disclosure Statement(s). (PTO/SB/08) Paper No(s). _____

13. ☐ Other: _____.

Quynh H. Nguyen

Quynh H. Nguyen
571-272-7489

Continuation of 11. does NOT place the application in condition for allowance because: Applicant's arguments has been fully considered but are not persuasive.

Applicant argues that "Staples describes a method for enabling a remote user to maintain a virtual presence at a corporate office including access to all facilities provides by the corporate office telephone system ..., but the main aspect of the invention is that it provices the ability to receive home telephone calls on the same communication line used for the virtual presence connection to the corporate office" (Remarks, pages 5-6). This is irrelevant.

Applicant argues that the virtual presence server is situated at a corporate office and therfore is not a part of public telecommunication network as claimed. Examiner respectfully submits that even though the virtual presence server is situated at a corporate office, the virtual presence server supports one or more user telephony communication devices via the public switched telephone network (PSTN) (col. 5, lines 28-30). Furthermore, this is a 103 rejection, the secondary reference Borst cited for the feature of storing in a public switching center (Fig. 1; col. 3, lines 1-12).

Applicant argues that "The Examiner does not specifically identify the reasons why one skilled in the art would have been motivated to select and combine the teachings of Staples and Borst. Examiner restpecfully disagrees. Staples teaches the virtual presence server interfaces to a PBX for routing the remote's user office calls to the remote user at the remote location. Borst teaches network ACD (Fig. 1) connect to public switching network 100 which includes switching nodes 101 and call allocator 103 which stores program controlled for routing calls to one of ACD systems 110-112 (col. 2, lines 54-67; col. 1, lines 13-16). Switching nodes 101 provide alternate destination redirection, information such as call type, called number, etc. are stored in switching nodes of PSTN (col. 3, lines 1-12). The combination of the two references would achieve the modification of storing connection information in memory in virtual presence server in the office in Staples to have the information stored in public switching network, hence the combination of the Staples and Borst teaches the claims invention.

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JXB/KKL

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/069,790 ✓	07/26/2002	Sigrid Hertelt	449122024700 ✓	5002

25227 7590 10/25/2006

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SUITE 300
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EXAMINER	
NGUYEN, QUYNH H	
ART UNIT	PAPER NUMBER
2614	

DATE MAILED: 10/25/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

DOCKETED FRG Resp Due/NTE Appeal Due
REMINDER: 12-25-06
DUE DATE: 1-25-07
FINAL DUE DATE: 4-25-07

Office Action Summary	Application No.	Applicant(s)	
	10/069,790	HERTELT ET AL.	
	Examiner	Art Unit	
	Quynh H. Nguyen	2614	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *amendment filed 7/5/06*. ✓

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed 7/5/06 has been entered. Claims 1-11 have been amended. No claims have been cancelled. No claims have been added. Claims 1-11 are still pending in this application, with claims 1 and 10 being independent.

2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

3. Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Staples et al. (U.S. Patent 5,889,845) in view of Borst et al. (U.S. Patent 6,366,668).

As to claim 1, Staples et al. teaches a method for redirection of telecommunications links comprising: redirecting a telecommunications which has been set up to a first telecommunications connection (*remote user's office calls*) to a second communications connection (*remote user at remote location*); transmitting information data which reflects a connection identification in parallel with the user data via the telecommunications link (col. 2, line 61 through col. 3, line 10); and storing, in a PBX via the PSTN (col. 5, lines 28-30) for the first connections connection (Fig. 2) and a public switching center for the second telecommunications connection (PBX 112 via the PSTN) the connection identification of the first telecommunications connection, of the

connection identification of the second telecommunications connection (Fig. 1; abstract - *where Staples discussed a method for diverting telecommunications connections for line identifications of a private branch exchange in a public switching office information stored to a telecommunications terminal with reference to the diverted telecommunications connections directed to one of the lines)* and status information which states whether the redirection should be carried out, and in that the redirection to the second telecommunications connection is performed in the public switching center for the first telecommunications connection (Figs. 12 and 14; col. 22, line 56 through col. 23, line 11).

What Staples differs from the instant application is that in Staples, connections identification information storing in memory 344 in virtual presence server 106 which is in the office, while the instant application the information is stored in a public switching center.

Borst et al. teaches network ACD (Fig. 1) connect to public switching network 100 which includes switching nodes 101 and call allocator 103 which stores program controlled for routing calls to one of ACD systems 110-112 (col. 2, lines 54-67; col. 1, lines 13-16). Switching nodes 101 provide alternate destination redirection, information such as call type, called number, etc. are stored in switching nodes of PSTN (col. 3, lines 1-12).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the teachings of Borst into the teachings of Staples for the purpose of saving cost for maintaining one database in the network over

maintaining each individual database in each ACD. For example, in a business environment, there is no need to buy equipment, maintain, and fix them instead utilize from the network. Furthermore, since switching nodes 101 of PSTN 100 administered all routings decisions, there is no requires for hardware and software development to implement, again there would be saving on extra hardware cost, as discussed by Borst, (col. 2, lines 22-35).

As to claims 2, 4, and 11, Staples et al. teaches the status of the redirection of the telecommunications links for the first telecommunications connection to the second telecommunications connection (Figs. 12 and 14; col. 22, line 56 through col. 23, line 11); setting up a telecommunications link from the second telecommunications connection to a third telecommunications connection and when setting up a telecommunications link from a third telecommunications connection to the second telecommunications connection, the information data which is transmitted in parallel with the user data by means of the telecommunications link is modified in the public switching centers such that it reflects the connection identification of the first telecommunication connection instead of the connection identification of the second telecommunication (abstract; col. 3, lines 10-40).

As to claim 3, Staples et al. teaches the first telecommunications connection is a connection within a private branch exchange (Fig. 2).

As to claim 5, Staples et al. teaches when an extension internal connection identification is entered, a telecommunications link, which originates from the second telecommunications connection is passed to the private branch exchange and to the

corresponding private branch exchange connection (Figs. 19 and 20; col. 28, lines 11-30).

As to claim 6, Staples et al. teaches one differentiation of the status information is temporarily switched off by entering a specific control signal (col. 3, lines 41-54).

As to claim 7, Staples et al. teaches activating redirection by entering an access code (col. 2, lines 55-60; col. 19, lines 56-67; col. 20, lines 23-51).

As to claim 8, Staples et al. teaches permanently presetting the second telecommunications connection (*remote user at remote location*), which is associated with the first telecommunications connection (*remote user's office calls*).

As to claim 9, Staples et al. teaches the second telecommunications connection which is associated with the first telecommunications connection is selected freely by transmission of a control signal when the redirection is activated (col. 20, lines 9-17; col. 28, lines 21-57).

Claim 10 is rejected for the same reasons as discussed above with respect to claim 1. Furthermore, Staples et al. teaches having means for modification of information data that reflects a connection identification (virtual present server 106).

Response to Arguments

4. Applicant's arguments filed 7/5/06 have been fully considered but they are not persuasive. Applicant's arguments are addressed in the above claims rejections.

Applicant argues that "The calls to the user's home telephone are directed to the virtual presence server, too, and then routed by the virtual presence server to the user's

home telephone while the user is connected to the corporate office ... Consequently, the system in Staples provides remote and transparent telephony and data access to the corporate office PBX and LAN..." (remarks, page 2). Examiner respectfully submits that this is irrelevant. Furthermore, Staples teaches the virtual presence server supports one or more user telephony communication devices via the public switched telephone network (PSTN) (col. 5, lines 28-30).

Regarding Applicant's remarks about the Borst reference (remarks, last paragraph of page 2 and first paragraph of page 3), first of all, Examiner respectfully submits that this is irrelevant. Secondly, Examiner cited Borst for the missing feature of storing in a public switching center the connection identification of the telecommunications connection in Staples. The combination of the two references would achieve the modification of storing connection information in memory in virtual presence server in the office in Staples to have the information stored in public switching network, hence the combination of the Staples and Borst teaches the claims invention.

Conclusion

5. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quynh H. Nguyen whose telephone number is 571-272-7489. The examiner can normally be reached on Monday - Thursday from 6:30 A.M. to 5:00 P.M.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wing Chan, can be reached on 571-272-7493. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Quynh H. Nguyen

October 23, 2006

US005889845A

United States Patent [19]

Staples et al.

[11] Patent Number: 5,889,845

[45] Date of Patent: *Mar. 30, 1999

[54] SYSTEM AND METHOD FOR PROVIDING A REMOTE USER WITH A VIRTUAL PRESENCE TO AN OFFICE

[75] Inventors: Leven E. Staples, Granbury; W. B. Barker; Kenneth L. Witt, both of San Antonio, all of Tex.

[73] Assignee: Data Race, Inc., San Antonio, Tex.

[*] Notice: The term of this patent shall not extend beyond the expiration date of Pat. No. 5,764,639.

[21] Appl. No.: 740,775

[22] Filed: Nov. 1, 1996

Related U.S. Application Data

[63] Continuation of Ser. No. 559,472, Nov. 15, 1995, Pat. No. 5,764,639.

[51] Int. Cl.[6] H04M 5/06

[52] U.S. Cl. 379/211; 379/93.01; 379/100.08; 379/265

[58] Field of Search 379/265, 266, 379/309, 207, 201, 67, 89, 93.01, 93.24, 100.01, 100.08

[56] References Cited

U.S. PATENT DOCUMENTS

4,674,115	6/1987	Kaleita et al.	379/201
5,291,551	3/1994	Conn et al.	379/265
5,384,831	1/1995	Creswell et al.	379/67
5,568,489	10/1996	Yien et al.	379/89
5,598,536	1/1997	Slaughter, III et al. .	
5,602,846	2/1997	Holmquist et al. .	
5,636,218	6/1997	Ishikawa et al. .	

FOREIGN PATENT DOCUMENTS

0 367 455 A2	5/1990	European Pat. Off. .
0 536 949 A2	4/1993	European Pat. Off. .

OTHER PUBLICATIONS

Patent Abstracts of Japan, Publication No. 60030248, dated Feb. 15, 1985.

Dieter Hochreuter, Michael Nash, "Hicom 300—eine Vielfalt neuer Möglichkeiten," Telcom Report (Siemens), vol. 18, No. 5, Oct. 1995, München, DE, XP000543153, pp. 265–267. (No Translation).

International Search Report for PCT/US96/16455 dated Apr. 24, 1997.

The ITU Telecommunication Standardization Sector (ITU-T), Draft VDSVD–S (Draft of Dec. 8, 1995), Copyright 1996, 22 pages.

The ITU Telecommunication Standardization Sector (ITU–T), Draft V.75 (Draft of Feb. 2, 1996), pp. 1–23.

Teltone OfficeLink, Teltone advertising brochure (Pub. Jan. 10, 1995).

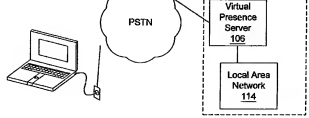
Primary Examiner—Ahmad F. Matar

Attorney, Agent, or Firm—Conley, Rose & Tayon; Jeffrey C. Hood

[57] ABSTRACT

A system and method for enabling a remote user to maintain a virtual presence at a corporate office and behave substantially as if the user were physically present at the corporate office. First the remote user establishes a virtual presence connection at the corporate office, including providing identification and security information. Once the remote user is connected, the virtual presence server instructs the corporate PBX to automatically forward all calls to the remote user. The virtual presence server also routes email, faxes, and LAN data to the remote user. The virtual presence server also extends the corporate PBX and corporate LAN features to the remote user, just as if the remote user were physically located in the corporate office. According to the invention, the remote user makes outgoing telephone calls, sends faxes, transmits data, sends email and performs Internet access as if the remote user were physically present in the corporate office. The virtual presence server and/or the user communication device also performs a call forwarding operation to call forward telephone calls made to the user's home to the virtual presence server at the corporate office. These calls are then routed through the virtual presence server to the user's home. Thus the user can receive home telephone calls while the user is connected to the corporate office, wherein the home telephone calls are received on the same telephone line which is being used for the virtual presence connection.

99 Claims, 21 Drawing Sheets



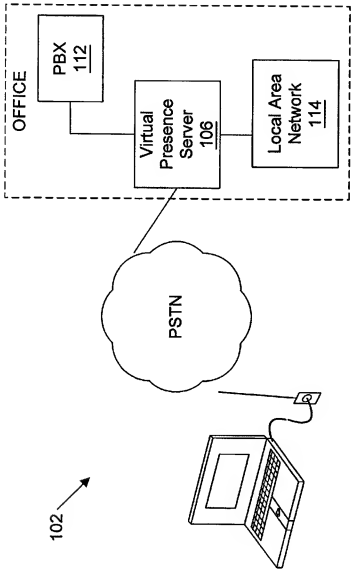

OFFICE
PBX
112
Virtual
Presence
Server
106
Local Area
Network
114
PSTN
102

FIG. 1

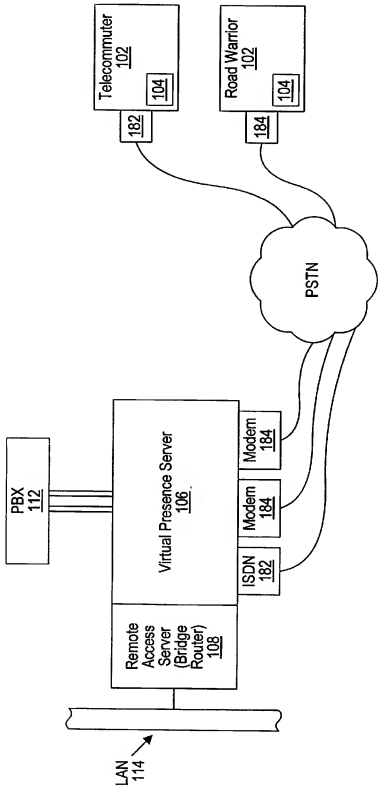

Telecommuter
102
104
182
Road Warrior
102
104
184
PSTN
PBX
112
Virtual Presence Server
106
Modem
184
Modem
184
ISDN
182
Remote
Access
Server
(Bridge
Router)
108
LAN
114

FIG. 2

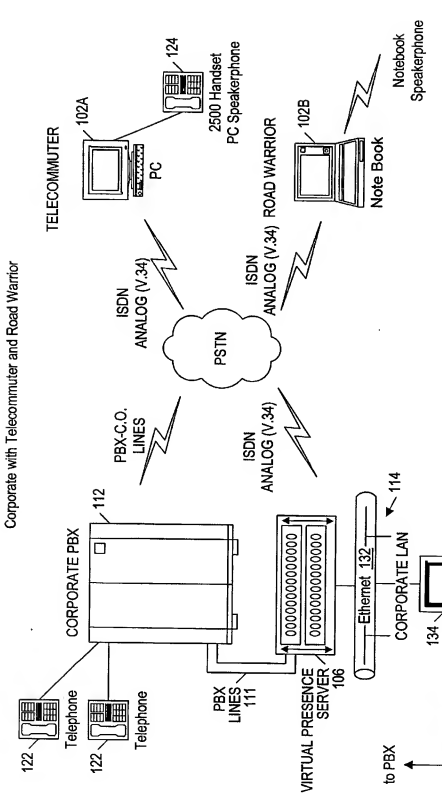

Corporate with Telecommuter and Road Warrior
TELECOMMUTER
102A
PC
124
2500 Handset
PC Speakerphone
ISDN
ANALOG (V.34)
PSTN
ISDN
ANALOG (V.34)
ROAD WARRIOR
102B
Note Book
Notebook
Speakerphone
PBX-C.O.
LINES
ISDN
ANALOG (V.34)
CORPORATE PBX
112
114
Ethernet 132
CORPORATE LAN
134
Desktop PC
122
Telephone
122
Telephone
PBX
LINES
111
VIRTUAL PRESENCE
SERVER
106
to PBX
122
Telephone

FIG. 3

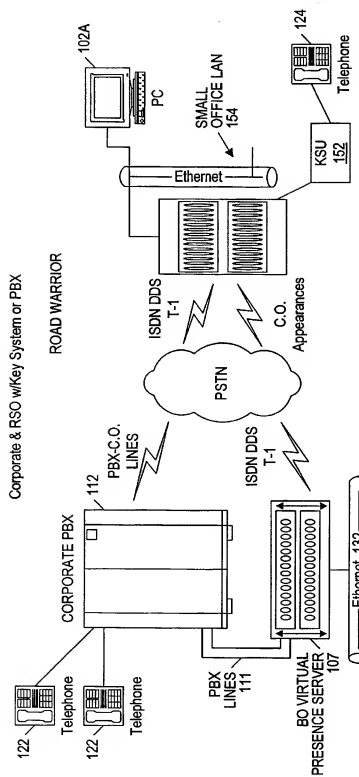

Corporate & RSO w/Key System or PBX
ROAD WARRIOR
102A
PC
SMALL OFFICE LAN 154
124
Telephone
Ethernet
KSU 152
ISDN DDS T-1
C.O. Appearances
PSTN
PBX-C.O. LINES
ISDN DDS T-1
112
CORPORATE PBX
114
Ethernet 132
CORPORATE LAN
134
Desktop PC
122
Telephone
122
Telephone
PBX LINES 111
BO VIRTUAL PRESENCE SERVER 107
to PBX
Telephone

FIG. 4

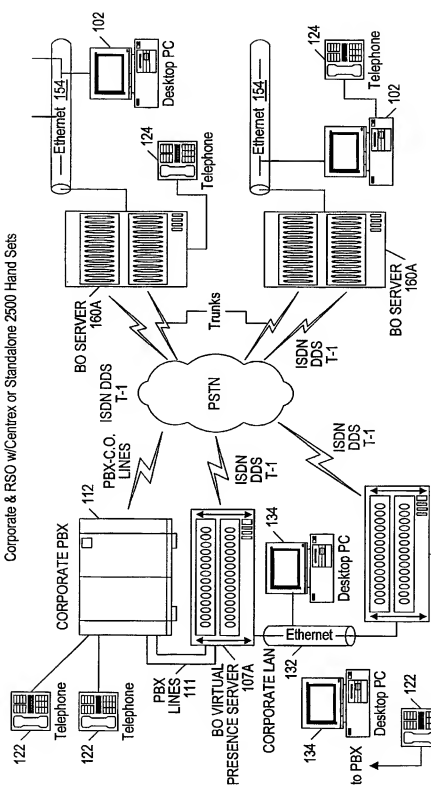

Corporate & RSO w/Centrex or Standalone 2500 Hand Sets
CORPORATE PBX
112
PBX-C.O. LINES
ISDN DDS T-1
PSTN
Trunks
BO SERVER 160A
Ethernet 154
102
Desktop PC
124
Telephone
122
PBX LINES 111
BO VIRTUAL PRESENCE SERVER 107A
CORPORATE LAN
132
134
Ethernet
to PBX
BO VIRTUAL PRESENCE SERVER 107A

FIG. 5

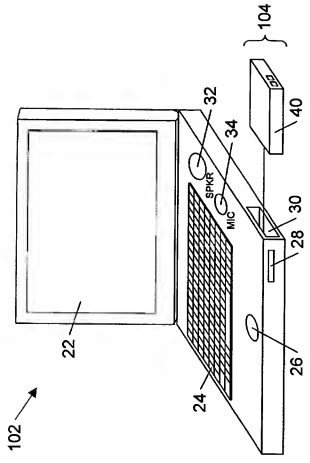
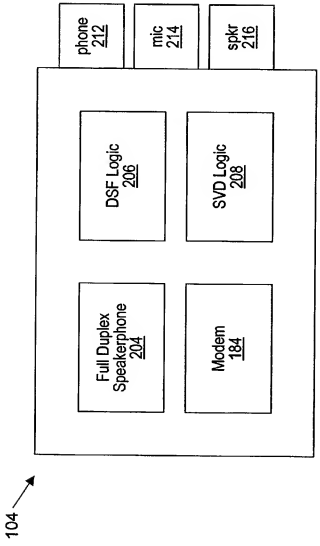


FIG. 6


phone
212
mic
214
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216
DSF Logic
206
SVD Logic
208
Full Duplex
Speakerphone
204
Modem
184
104

FIG. 7

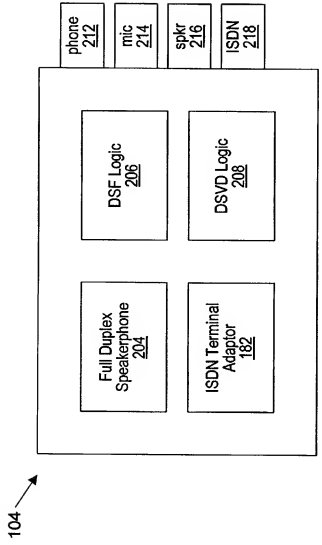
phone 212
mic 214
spkr 216
ISDN 218
DSF Logic 206
DSVD Logic 208
Full Duplex Speakerphone 204
ISDN Terminal Adaptor 182
104

FIG. 8

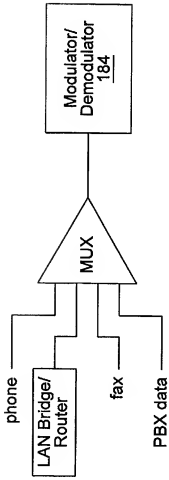
Modulator/
Demodulator
184
MUX
phone
LAN Bridge/
Router
fax
PBX data

FIG. 9

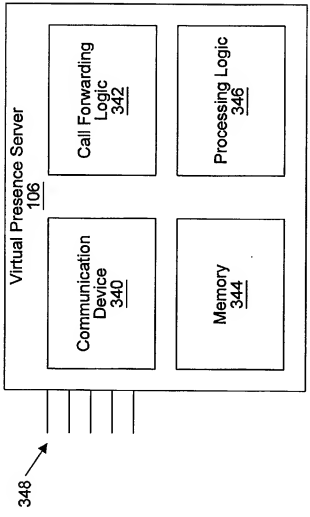
Virtual Presence Server
106
Communication Device
340
Call Forwarding Logic
342
Memory
344
Processing Logic
346
348

FIG. 10

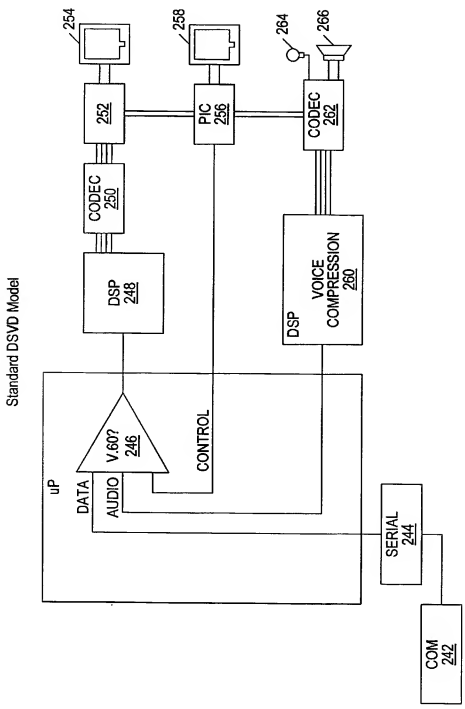
Standard DSVD Model
uP
DATA
AUDIO
V.60? 246
CONTROL
DSP 248
CODEC 250
252
254
PIC 256
258
CODEC 262
264
266
DSP
VOICE COMPRESSION 260
SERIAL 244
COM 242

FIG. 11A

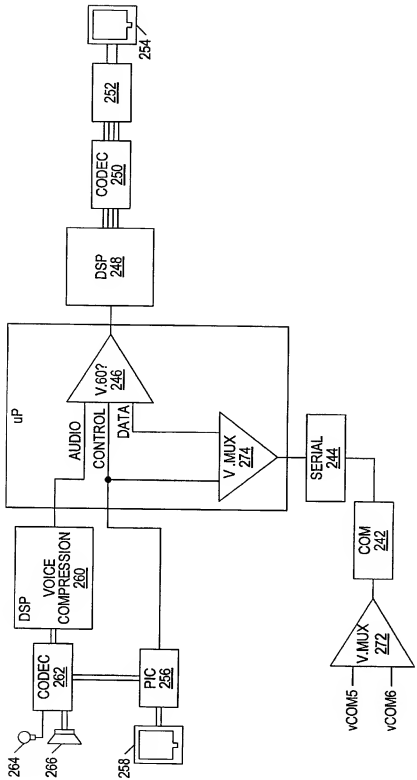
254
252
CODEC 250
DSP 248
uP
V.607 246
AUDIO
CONTROL
DATA
V.MUX 274
SERIAL 244
COM 242
V.MUX 272
vCOM5
vCOM6
DSP VOICE COMPRESSION 260
CODEC 262
PIC 256
264
266
258

FIG. 11B

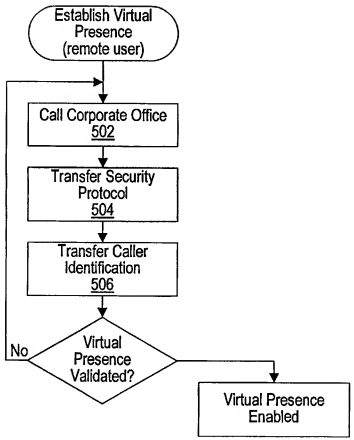
Establish Virtual Presence (remote user)
Call Corporate Office 502
Transfer Security Protocol 504
Transfer Caller Identification 506
Virtual Presence Validated?
No
Virtual Presence Enabled

FIG. 12

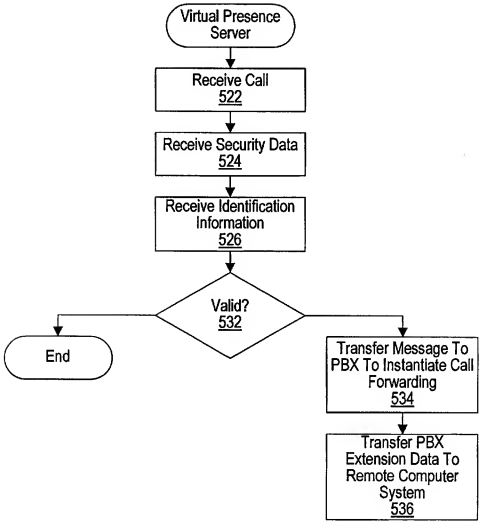
Virtual Presence Server
Receive Call 522
Receive Security Data 524
Receive Identification Information 526
Valid? 532
End
Transfer Message To PBX To Instantiate Call Forwarding 534
Transfer PBX Extension Data To Remote Computer System 536

FIG. 13

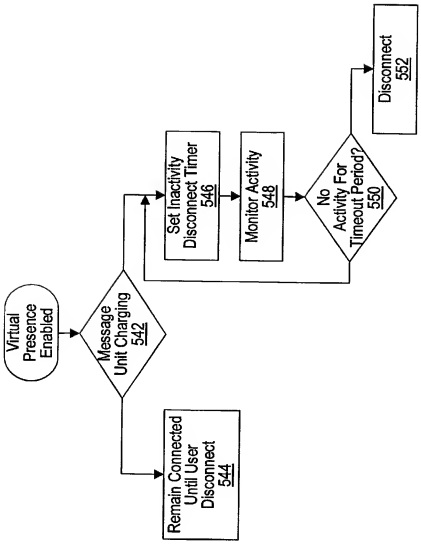
Virtual Presence Enabled
Message Unit Charging 542
Remain Connected Until User Disconnect 544
Set Inactivity Disconnect Timer 546
Monitor Activity 548
No Activity For Timeout Period? 550
Disconnect 552

FIG. 14

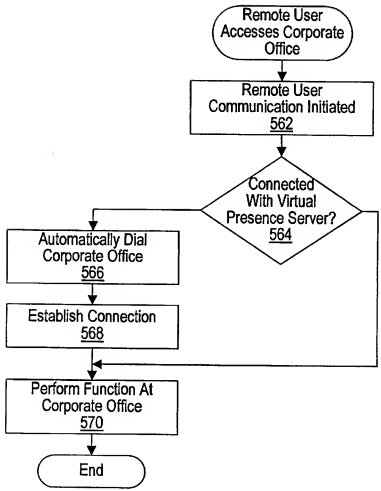
Remote User Accesses Corporate Office
Remote User Communication Initiated 562
Connected With Virtual Presence Server? 564
Automatically Dial Corporate Office 566
Establish Connection 568
Perform Function At Corporate Office 570
End

FIG. 15

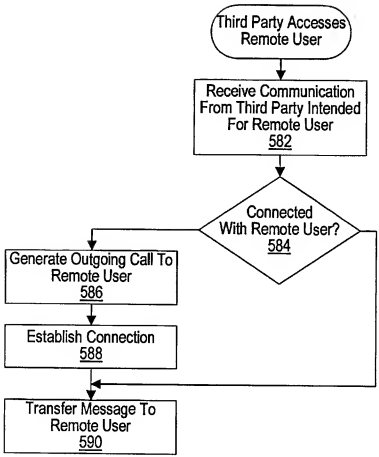
Third Party Accesses Remote User
Receive Communication From Third Party Intended For Remote User
582
Connected With Remote User?
584
Generate Outgoing Call To Remote User
586
Establish Connection
588
Transfer Message To Remote User
590

FIG. 16

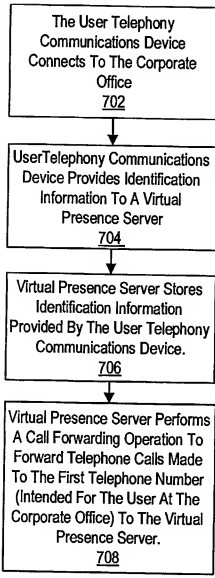
The User Telephony Communications Device Connects To The Corporate Office
702
UserTelephony Communications Device Provides Identification Information To A Virtual Presence Server
704
Virtual Presence Server Stores Identification Information Provided By The User Telephony Communications Device.
706
Virtual Presence Server Performs A Call Forwarding Operation To Forward Telephone Calls Made To The First Telephone Number (Intended For The User At The Corporate Office) To The Virtual Presence Server.
708

FIG. 17

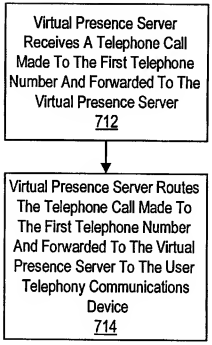
Virtual Presence Server Receives A Telephone Call Made To The First Telephone Number And Forwarded To The Virtual Presence Server
712
Virtual Presence Server Routes The Telephone Call Made To The First Telephone Number And Forwarded To The Virtual Presence Server To The User Telephony Communications Device
714

FIG. 18

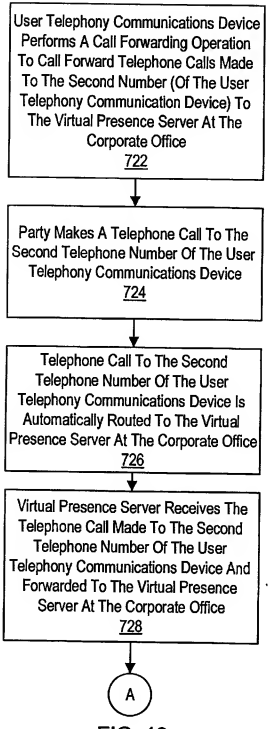
User Telephony Communications Device Performs A Call Forwarding Operation To Call Forward Telephone Calls Made To The Second Number (Of The User Telephony Communication Device) To The Virtual Presence Server At The Corporate Office
722
Party Makes A Telephone Call To The Second Telephone Number Of The User Telephony Communications Device
724
Telephone Call To The Second Telephone Number Of The User Telephony Communications Device Is Automatically Routed To The Virtual Presence Server At The Corporate Office
726
Virtual Presence Server Receives The Telephone Call Made To The Second Telephone Number Of The User Telephony Communications Device And Forwarded To The Virtual Presence Server At The Corporate Office
728
A

FIG. 19

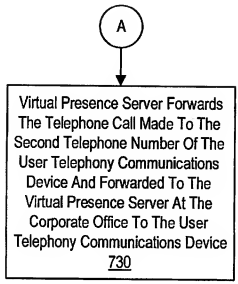
A
Virtual Presence Server Forwards The Telephone Call Made To The Second Telephone Number Of The User Telephony Communications Device And Forwarded To The Virtual Presence Server At The Corporate Office To The User Telephony Communications Device
730

FIG. 20

SYSTEM AND METHOD FOR PROVIDING A REMOTE USER WITH A VIRTUAL PRESENCE TO AN OFFICE

CONTINUATION DATA

This is a continuation of U.S. application Ser. No. 08/559,472 titled "System and Method for Providing a Remote User with a Virtual Presence to an Office" and filed Nov. 15, 1995, whose inventors are Leven E. Staples, W. B. Barker, and Kenneth L. Witt, which issued on Jun. 9, 1998 as U.S. Pat. No. 5,764,639.

FIELD OF THE INVENTION

The present invention relates a system and method which provides connectivity between one or more remote users and a corporate office, wherein the remote users have a virtual presence at the corporate office, including access to the facilities and features provided by the corporate office telephone system and local area network, wherein the invention also provides the ability to receive home telephone calls on the same communication line used for the virtual presence connection.

DESCRIPTION OF THE RELATED ART

Connectivity between remote workers and an office is becoming increasingly important in today's business climate. Business people who travel, commonly referred to as "road warriors", desire to "stay connected" to the corporate office as much as possible. In addition, a current trend in business is the "telecommuter", e.g., an employee who works primarily at home and is remotely connected to the corporate office. Another recent trend in business is referred to as the "remote small office" (RSO) or "branch office" (BO), wherein a group of workers or employees are in a location remote from the company's headquarters or corporate office and are electronically connected to the corporate office.

In each of the above situations, the remote individuals require remote and transparent connectivity to the corporate office, including connectivity to the corporate office local area network (LAN) and the corporate office private branch exchange (PBX) or Centrex Facility. In the present disclosure, a PBX and a Centrex Facility, as well as other types of telephony server systems, are referred to collectively as a PBX for convenience. Further, the remote individuals desire a "virtual presence" at the corporate office, wherein the remote users operate remotely just as if they were physically located in the corporate office.

As corporations move away from mainframe based systems to PC based systems and local area networks (LANs), the options for remote connectivity have improved. In general, personal computers and LANs facilitate remote access to computing resources. Remote connectivity is also made possible with the arrival of affordable, reliable, digital telecommunications services and inexpensive network hardware. Currently, a variety of digital telecommunications services now support remote connections to enterprise networks, among these being Frame Relay, ISDN, Digital Data Service, and TI.

Current remote connectivity software solutions provide remote access between computer systems at different physical locations. For example, one class of remote connectivity software, referred to as "remote control software", allows a user at a local computer system to control and manipulate a remote computer system as if the user were present at the remote computer system. The user enters commands into the local computer, either through a command line or a graphical user interface (GUI), and software executing on the local computer transmits the commands from the local computer to the remote computer. The remote computer executes the commands and provides the output or response back to the local computer.

Applicant is aware of products from various PBX vendors which provide a degree of connectivity to the remote office based upon certain types of transmission media, such as ISDN. Applicant is specifically aware of a product from Siemens Rolm referred to as the Rolm Officepoint Communications system, which provides an integrated ISDN system for remote and small offices. Applicant is also aware of products offered by various remote access vendors which provide data only connectivity to the remote office. These products generally do not address the voice communication requirements of the user. Further, these products do not address the particular requirements of the road warrior.

Therefore, a system and method is desired which provides remote connectivity between a remote computer or communications device and a corporate office, wherein the system provides remote and transparent telephony and data access to the corporate office Private Branch Exchange (PBX) and local area network (LAN). A system and method is also desired which provides a remote user with a virtual presence at the corporate office, including access to all of the facilities and features of the corporate office PBX and LAN. It would also be highly desirable for a user to be able to receive home telephone calls while the user has a virtual presence connection to the corporate office. It would further be desirable for the user to be able to receive home telephone calls on the same telephone line or communication line being used for the virtual presence connection.

SUMMARY OF THE INVENTION

The present invention comprises a system and method for enabling a remote user to maintain a virtual presence at a corporate office. The present invention allows a remote user to connect to a corporate office and behave just as if the user were physically present at the corporate office. Thus the remote user's telephone behaves as a PBX extension. In addition, the remote user may send and receive faxes and email, have Internet access and maintain LAN connectivity, just as if the user were present at the corporate office.

The remote computer system includes a user telephony communications device, and the remote computer executes virtual presence software according to the present invention. The corporate office includes a virtual presence server according to the invention which connects to the corporate PBX and also to the corporate LAN. The virtual presence server executes software which enables the remote user to maintain a virtual presence at the corporate office.

When the remote user desires to establish a virtual presence at the corporate office, the remote user directs the user telephony communications device to dial the virtual presence server and establish a connection. This includes providing identification information and security information to the virtual presence server.

Once the remote user is connected, the virtual presence server instructs the corporate PBX to automatically forward the remote user's office calls to the remote user at the remote location. The virtual presence server preferably performs a remote access call forwarding operation to direct calls that are made to the remote user's office telephone number to be forwarded to the virtual presence server. The virtual pres-

ence server then routes these forwarded telephone calls to the user telephony communication device being used by the remote user. Thus, external parties which call the user at the office are automatically routed to the remote user by the virtual presence server.

The virtual presence server also routes email, faxes, and LAN data to the remote user. The virtual presence server also extends the corporate PBX and corporate LAN features to the remote user, just as if the remote user were physically located in the corporate office.

The present invention enables the concept of virtual presence or "telepresence", whereby a user at a remote location has the full capabilities and user interfaces of the corporate office just as if the user were physically located at the corporate office. Thus the telephone of the remote user mirrors the telephone the user sees at the corporate office, including substantially the same button configurations at substantially the same locations and performing substantially the same functions. According to the present invention, the remote user dials the local extension number or DID (direct inward dialing) number of co-workers in the corporate office, and can be reached with a local extension number, just as if the remote user were physically located in the corporate office.

According to the invention, the remote user makes outgoing telephone calls, sends faxes, transmits data, sends email and performs Internet access as if the remote user were physically present in the corporate office. Likewise, incoming calls, faxes, data transmissions and email received at the corporate office are routed to the remote user as if the remote user were physically present in the corporate office.

Therefore, a co-worker or external party who telephones the user at the corporate office, or sends email or a fax to the user at the corporate office, is unaware that the user is actually not physically located at the corporate office, but rather is at a remote location. In general, a secretary or receptionist located just outside the user's physical corporate office location is unable to discern, without opening the door, whether the user is located in his office at the corporate office or at a remote location.

The present invention includes methods for disconnecting and re-establishing virtual presence to reduce message rate charging. When a connection first occurs, the system determines if message rate charging is in effect. If so, and if the user desires temporary disconnects, the remote computer system monitors activity and disconnects after certain elapsed periods of inactivity. When the remote user desires to contact the corporate office, or the virtual presence server desires to route data to the remote user, then the respective system automatically and transparently reconnects to reestablish virtual presence and perform the communication. These reconnects preferably occur transparently to the user, and thus a virtual presence is maintained from the user's perspective, even during temporary disconnects.

For the telecommuter, the present invention optionally performs a remote access call forwarding operation to instruct the telephone company Central Office to automatically route calls made to the telecommuter's home number, i.e., personal calls, to the corporate office. These calls are forwarded to the virtual presence server as described above and are then routed to the telecommuter's home by the virtual presence server. Thus when a telecommuter is connected to the corporate office according to the virtual presence system of the invention, an external party who attempts to call the telecommuter at home is not blocked out, but rather is routed through the corporate office virtual presence server to the telecommuter.

BRIEF DESCRIPTION OF THE DRAWINGS

A better understanding of the present invention can be obtained when the following detailed description of the preferred embodiment is considered in conjunction with the following drawings, in which:

FIGS. **1** and **2** illustrate a system wherein a remote user maintains a virtual presence to a corporate office according to the present invention;

FIGS. **3–5** illustrate various embodiments of the virtual presence system of the present invention;

FIG. **6** illustrates the individual remote worker logic configured as a PC Card adapted for connecting to the remote computer system of FIG. **1**;

FIGS. **7** and **8** are block diagrams illustrating embodiments of the individual remote worker unit of FIG. **1**;

FIG. **9** illustrates a conceptual block diagram of the operation of the modem of FIG. **7**;

FIG. **10** is a block diagram of the virtual presence server of the preferred embodiment;

FIG. **11**A illustrates a standard DSVD hardware model according to the prior art;

FIG. **11**B illustrates a modem architecture according to the present invention;

FIG. **12** is a flowchart diagram illustrating operation of the individual remote worker unit of the present invention;

FIG. **13** is a flowchart diagram illustrating operation of the virtual presence server of the present invention;

FIG. **14** is a flowchart diagram illustrating operation of the virtual presence server of the present invention;

FIG. **15** is a flowchart diagram illustrating operation of the remote user accessing the corporate office;

FIG. **16** is a flowchart diagram illustrating operation of the virtual presence server accessing the remote user;

FIG. **17** is a flowchart diagram illustrating operation of the virtual presence system where the virtual presence server performs a call forwarding operation to forward the user's office extension telephone calls to the virtual presence server;

FIG. **18** is a flowchart diagram illustrating operation of the virtual presence server receiving a telephone call to the user's office extension and routing the call to the user's remote location;

FIGS. **19** and **20** are a flowchart diagram illustrating operation of the virtual presence system where the system performs a call forwarding operation to forward calls from external parties through the virtual presence server to the user's remote location.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1—Virtual Presence System

Referring now to FIG. **1**, a block diagram of a Remote Connectivity and Virtual Presence System according to the present invention is shown. As shown, a user who is remote from his/her "corporate office" utilizes a computer system or other communications device, referred to generally as computer system **102**, to communicate and/or connect with the corporate office, also referred to as the home office. In the present disclosure, the term "corporate office" is intended to generally mean an office location or a data site where a remote user is desired to be connected. In general, the corporate office will be a headquarters office or corporate office, a government agency office, or another type of office, to which the user desires a "virtual presence."

The remote user preferably uses a computer system, such as laptop **102**, to connect to the corporate office. The remote user may also use other types of communication devices, such as a personal digital assistant (PDA) or a cellular phone, as desired. The computer system **102** includes a user telephony communication device **104** (FIG. **2**) according to the present invention which provides transparent telephone and data connectivity and virtual presence to the corporate office. The user telephony communication device **104** preferably comprises a hardware card and/or software comprised in the computer system **102** which facilitate the remote connectivity and virtual presence.

The user telephony communication device **104** couples through a communication mechanism or channel to a virtual presence server **106** at the corporate office, i.e., the office where the user desires to have a "virtual presence" or have "telepresence". In the preferred embodiment, as shown, the communication mechanism is the public switched telephone network (PSTN), using either conventional analog transmission or ISDN (Integrated Services Digital Network) transmission. In the present disclosure, the term "public switched telephone network" (PSTN) includes any of various types of communications mechanisms, including analog or digital telephony transmission as mentioned above, DSL (Digital Subscriber Line), such as ADSL or HDSL, ATM (Asynchronous Transfer Mode), FDDI (Fiber Distributed Data Networks), and T1 lines, among others.

The virtual presence server **106** preferably supports one or more user telephony communication devices **104** via the public switched telephone network (PSTN). The virtual presence server **106** at the corporate office preferably supports a mixture of simultaneous analog and ISDN connections for connecting to various user telephony communication devices **104**. The virtual presence server **106** is preferably a high performance computer system executing virtual presence software according to the invention.

The virtual presence server **106** interfaces to a telephony server **112**, such as a private branch exchange (PBX) or Centrex unit in the corporate office. In embodiments where the corporate office includes a call server instead of a conventional PBX, the virtual presence server **106** connects to the call server. In the present disclosure, the term "telephony server" is intended to include a PBX, Centrex system, and other devices or systems which perform telephony switching services or functions. Also, the term "PBX" is used herein to be equivalent to "telephony server" for convenience.

In one embodiment, the virtual presence server **106** performs the functions of a call server as well as a virtual presence server. For example, the virtual presence server **106** in one embodiment comprises a SCSA (Signal Computing System Architecture) or MVIP server for performing call management functions as well as virtual presence functions.

The virtual presence server **106** also interfaces to a local area network (LAN) **114** at the corporate office. The LAN **114** may use Ethernet, Token Ring, or other types of protocols. The LAN may also use the Isochronous Ethernet (IsoEthernet) protocol, which is IEEE specification 802.9a.

Referring now to FIG. **2**, the virtual presence server **106** preferably includes one or more analog modems **184** for communicating analog signals over telephone lines, and one or more ISDN terminal adapters **182** for ISDN communications. It is noted that the virtual presence server **106** may include only analog modems **184** or only ISDN terminal adapters **182**, or may include a combination. The virtual presence server **106** may include other types of communications devices and/or use other types of communications media, as desired.

As shown in FIG. **2**, the corporate office may also include a remote access server **108** and/or a bridge router for performing more conventional remote access functions. Alternatively, the virtual presence server **106** includes remote access software for performing remote accessing functions in addition to the virtual presence functions of the present invention.

As shown, the remote user may either be a telecommuter or a road warrior, or may be a resident in a branch office, also referred to as a remote small office. As noted above, the remote user preferably uses a computer system **102** which includes a user telephony communication device **104**. The user telephony communication device **104** comprised in the remote computer system **102** and used by the remote user may comprise either an analog modem **184** or an ISDN terminal adapter **182**, or another type of communications device, as mentioned above. It is noted that the computer **102** and/or user telephony communication device **104** may connect to the PSTN using any of various communications devices and any of various communications media, as desired. In the present disclosure, the term "user telephony communications device" is intended to include analog modems, ISDN terminal adapters, ADSL or ATM devices, and any of various other types of communications devices which use any of various types of communications media.

The virtual presence server **106** located at the corporate office connects to the corporate PBX **112** as one or more extensions and connects to the corporate LAN **114** as one or more remote terminals. LAN nodes, or a separate LAN segment. The virtual presence server **106** then provides these features over the public switched telephone network (PSTN) to a remote site, i.e., to the remote user. Thus, the virtual presence server **106** of the present invention operates to extend PBX features, as well as LAN features, to the remote users. It is noted that the system shown in FIGS. **1** and **2** does not include a key system or PBX intervening between the virtual presence server **106** and the remote users.

The user telephony communication device **104** in the computer system **102**, as well as the virtual presence server **106** at the corporate office, allow a remote user to seamlessly access and use resources at the corporate office, such as the corporate office private branch exchange (PBX) **112** and local area network (LAN) **114**. Thus, a remote user with a virtual presence connection according to the present invention has all of the facilities and features provided by the PBX **112** and LAN **114** at the corporate office while working from a remote location.

Further, the present invention enables the concept of virtual presence or "telepresence", whereby a user at a remote location has the full capabilities and user interfaces of the corporate office just as if the user were physically located at the corporate office. In other words, the system of the present invention allows the remote user to have a virtual presence at the corporate office as if the user were actually present at the corporate office.

Thus the telecommuter or road warrior using a virtual telephone on his/her computer "sees" a virtual telephone that optionally substantially mirrors the telephone the user sees at the corporate office, including substantially the same button configurations at substantially the same locations and performing substantially the same functions. In one embodiment, the user configures the virtual telephone to provide different and/or more advanced features than the telephone at the corporate office.

Typically, a person physically located in a corporate office dials a local extension number or DID (direct inward

dialing) number, such as an N digit extension number, to call a co-worker in the corporate office. According to the present invention, the remote user dials the same local extension number of a co-worker in the corporate office, just as if the remote user were physically located in the corporate office. Similarly, a co-worker in the corporate office dials the local extension of the remote user and accesses the remote user, just as if the remote user were physically located in the corporate office.

According to the invention, the remote user makes outgoing telephone calls, sends faxes, transmits data, sends email and performs Internet access as if the remote user were physically present in the corporate office. Likewise, incoming calls, faxes, data transmissions and email received at the corporate office are routed to the remote user as if the remote user were physically present in the corporate office.

Incoming calls are preferably automatically routed to the remote user. In the preferred embodiment, once the remote user is connected, the virtual presence server instructs the corporate PBX or telephony server to automatically forward the remote user's office calls to the remote user at the remote location. The virtual presence server preferably performs a remote access call forwarding (RACF) operation to direct calls that are made to the remote user's office telephone number to be forwarded to the virtual presence server. The virtual presence server then routes these forwarded telephone calls to the user telephony communication device being used by the remote user. Thus, external parties which call the user at the office are automatically routed to the remote user by the virtual presence server.

Faxes may also be automatically routed to the remote user if the remote user has a personal fax machine and/or personal fax number at the corporate office. It is noted that, for faxes to be automatically routed from the corporate office to the remote user, the corporate office is not required to have a physical fax machine, but is only required to have a direct number to receive faxes.

Therefore, a co-worker or other party who telephones the remote user at the corporate office, or sends email, data or a fax to the remote user at the corporate office, is unaware that the user is actually not physically located at the corporate office, but rather is at a remote location. In general, a secretary or receptionist located just outside the user's physical corporate office location is unable to discern whether the user is located in his office at the corporate office or at a remote location. Thus the remote user maintains a virtual presence which is "just like being there".

FIGS. 3–5: Embodiments of the Invention

Referring now to FIGS. 3–5, various embodiments of the present invention are shown. As shown, the system of the present invention may be used for various types of remote users.

1. FIG. 3: Telecommuters and Road Warriors

Referring now to FIG. **3**, an embodiment used for telecommuters and road warriors is shown. For a user who is a "telecommuter", i.e., a user who is working at home and remotely connects to the corporate office, the telecommuter may operate with either a desktop or portable computer system, or optionally with another type of communications device. FIG. **3** illustrates a telecommuter operating with a desktop computer system, designated as **102**A. If the telecommuter operates with a desktop computer system **102**A, the user telephony communication device **104** is preferably an add-in card to an expansion bus of the computer system **102**A, such as a PCI (Peripheral Component Interconnect) card or AT bus card, or may be an external device.

As shown in FIG. **3**, in one embodiment a telephone instrument **124** is connected to the computer system **102**A. Alternatively, or additionally, the computer system **102**A executes software which presents a "virtual telephone" on the video screen of the computer system **102**A. The virtual telephone executing on the computer system preferably uses the computer's speakerphone, or the computer's built-in microphone and speakers, as the voice transmitter and receiver for the virtual telephone.

For a "road warrior", i.e., a business traveler operating with a portable or notebook computer **102**B, the user telephony communication device **104** preferably comprises a PC Card, or the user telephony communication device logic is hardwired to the computer motherboard. Users who are "road warriors", i.e., business users who travel and desire to "stay connected" to the corporate office, generally use a portable computer system **102**B or a portable communications device (not shown). Thus, for road warriors, the user telephony communication device **104** preferably comprises a PCMCIA card, also referred to as a PC Card, adapted for insertion into a PCMCIA slot of the portable computer system **102**B. Also, ink if the telecommuter uses a portable computer or notebook computer, the user telephony communication device **104** also preferably comprises a PC Card.

The portable computer system **102**B may include an external telephone instrument which connects to the computer system **102**B. Alternatively, or additionally, as shown, the portable computer system **102**B preferably executes software which presents a "virtual telephone" on the video screen of the computer system **102**B, as described above. In this embodiment, the portable computer **102**B preferably includes an integrated speakerphone which provides transmitter/receiver capabilities.

As shown, each of the computers **102**A and **102**B are connected to the corporate office virtual presence server **106** via the public switched telephone network (PSTN). Each of the computers **102**A and **102**B are also connected to the corporate office PBX **112** via the PSTN.

In one embodiment, the user telephony communication device **104** includes an analog modem **184**, preferably a V.34 modem, which is used where an ordinary analog telephone line is available to connect to the corporate office. In a second embodiment, the user telephony communication device **104** utilizes an integrated services digital network (ISDN) terminal adapter **182**. The ISDN embodiment provides higher speed data transmissions and improved voice quality. Any of the various embodiments preferably also supports a local group three facsimile (fax) machine.

The PSTN connects to the corporate office virtual presence server **106** preferably via either ISDN terminal adapters **182** or analog V.34 modems **184**, and the PSTN connects to the corporate PBX via PBX—Central Office phone lines, as is well known. As shown in FIG. **3**, the virtual presence server **106** connects to the corporate PBX **112** via PBX lines. The corporate PBX **112** connects to various telephone instruments **122** in the corporate office, as is well known. The virtual presence server **106** connects to the corporate PBX **112** to extend PBX features to the remote user and also to support voice communication between the corporate office and the remote user.

The virtual presence server **106** also connects to the corporate local area network (LAN) **114**. As shown, the corporate LAN **114** may comprise an Ethernet network **132**, a Token Ring network, or other type of local area network, as desired. Various computer systems are connected to the LAN **114**, as is well known.

In one embodiment, the computer systems **102**A and **102**B comprise DSVD (digital simultaneous voice and data) modems as well as the appropriate software for enabling

simultaneous voice and data transmissions. In another embodiment, the computer systems **102**A and **102**B include a communications device, such as a modem, which utilizes a special protocol for multiplexing multiple data types on a single communications line, such as a telephone line, including voice, LAN data, fax data, and telephony control data. In the present disclosure, the term "telephony control data" includes PBX extension data as well as other telephony control information.

It is noted that a road warrior preferably has virtual phone and virtual fax software applications executing on his computer system. The telecommuter operating from his home may include a "real" fax machine as well as a "real" phone. Where a telecommuter's system includes a physical fax machine, and an ISDN connection is used, the analog facsimile data generated by the fax machine is preferably re-digitized in the remote computer system **102** and communicated over the PSTN to the virtual presence server **106**. In this embodiment, each of the remote computer system **102** and the virtual presence server **106** include a fax/modem chip. When the remote user sends a fax using the "real" fax machine, the remote computer **102** receives the fax, converts the analog data to digital data, and transmits the digital data to the virtual presence server **106**. The virtual presence server **106** uses its fax modem to perform digital to analog conversion and provides the analog fax data to a "real" or virtual fax machine at any location, such as the corporate office. Alternatively, the virtual presence server may forward the fax data to a fax server for transmission.

2. FIG. 4: Branch Office with Key System or PBX

Referring now to FIG. **4**, a system according to the present invention is shown which enables users in a branch office to connect to a corporate office. In a branch office, the user telephony communication device **104** is preferably a rack mounted device, referred to as an BO Server **160**, which includes multiple inputs and which handles multiple phone lines. As shown, the branch office preferably includes its own local area network (LAN) **154** for connecting multiple computer systems. The branch office also preferably includes a key system unit (KSU) **152** or small PBX which provides telephone connectivity for telephones in the branch office.

As shown, each of the computers **102** in the branch office are connected to the remote office LAN **154**, and the LAN **154** in turn connects to the BO Server **160**. The BO Server **160** connects to a corporate office BO virtual presence server **107** via the PSTN. The BO virtual presence server **107** is similar to the virtual presence server **106** described above. The BO Server **160** also connects to the corporate office PBX **112** via the public switched telephone network (PSTN).

The BO virtual presence server **107** in the corporate office which interfaces to the BO server **160** in a branch office is preferably different than the virtual presence server **106** which interfaces to telecommuters and road warriors. The BO virtual presence server **107** is preferably different due to the need of the BO virtual presence server **107** to interface to a small key system or small PBX in the remote office. In the embodiments of FIGS. **5** and **6**, if telecommuters and road warriors desire to remotely connect to the corporate office, then the corporate office preferably includes a separate virtual presence server **106** dedicated to the telecommuters and road warriors. Thus in the preferred embodiment the functionality between the two different types of virtual presence servers **106** and **107** is not mixed. In an alternate embodiment, the corporate office includes a single virtual presence server **106** which serves both a branch office as well as telecommuters and road warriors.

The computers **102** and telephones **124** in the remote office are connected to the corporate office through the BO Server **160** and the PSTN. The BO Server **160** connects to the PSTN using either ISDN service, DDS (digital data service), leased lines, such as T1 lines, or other communications devices or media. The BO Server **160** may also connect to the corporate office virtual presence server **107** using a plurality of analog modems, as desired. The PSTN connects to the corporate office virtual presence server **107** via communications media such as ISDN, DDS, T1 lines, or analog V.34 modems, and the PSTN connects to the corporate PBX via PBX—Central Office phone lines, as is well known.

As discussed above with reference to FIG. 3, in FIG. 4 the BO virtual presence server **107** in the corporate office connects to the corporate PBX **112** via PBX lines. The corporate PBX **112** connects to various telephone instruments **122** in the corporate office, as is well known. The BO virtual presence server **107** also connects to the corporate local area network (LAN) **114**. As shown, the corporate LAN **114** may comprise an Ethernet network **132**, a Token Ring network, or other local area network, as desired. Various computer systems **134** are connected to the LAN **114**, as is well known.

In a branch office application, the BO server **160** supports telephone connectivity, also referred to as Central Office (C.O.) appearances, wherein a user in the remote office is not required to "hack-call" telephone calls to other users in the remote office. In other words, for a user in the remote office to call a user next door in the remote office, the user is not required to call the corporate office and then have the virtual presence server **107** in the corporate office call back to the next door user in the remote office.

In one embodiment of FIG. 4, the computer systems **102** and/or the BO server **160** further comprise DSVD (digital simultaneous voice and data) modems as well as the appropriate software for enabling simultaneous voice and data transmissions. As discussed further below, one embodiment includes communications devices such as modems which utilize a special protocol for multiplexing multiple data types on a single communications line, including two or more of voice, LAN data, fax data, and telephony control data.

It is noted that the key system unit **152** does not provide the user with complete virtual presence because the user is noticeably in a remote office where he is required to select an outside line. Thus the user does not enter the same sequence of button entries that the user would enter if the user were physically in the corporate office. A key system unit also places a different protocol between the user and the telephone, depending on whether the user is calling someone in the remote office or in the corporate office. Thus a branch office which uses KSU **152** does not have the same level of telepresence as a branch office including a BO Server **160** embodying an internal PBX function. This is because the KSU **152** is located between the remote users and the BO server **160**.

In one embodiment, the BO server **160** displaces a key system unit at the branch office. In other words, the BO server **106** executes software which provides at least a subset of the functionality of a key system or PBX, and this "soft" key system or PBX is operated over the remote office LAN **154**. The BO Server **160** is thus programmed to behave as a PBX, wherein the BO Server **160** offers a local intercom between the stations.

Thus, in a remote office with 10 people and having an BO server **160**, one remote office worker can talk to someone in

the next office using a local extension in the remote office or place a local call in the BO area code. The BO server **160** also provides the same user interface to each remote worker as if the respective remote worker were physically located in the corporate office.

The BO Server **160** also may act as a file server or application server in the remote office LAN **154**, as desired. Alternatively, the BO Server **160** acts as an additional server on the remote office LAN **154** if a server already exists.

3. FIG. **5**: Branch Office

Referring now to FIG. **5**, a system according to another embodiment of the present invention is shown which enables users in a branch office to connect to a corporate office. FIG. **5** illustrates a corporate office virtual presence server **107A** interfacing to two branch offices. The system shown in FIG. **5** is similar to the system shown in FIG. **4**, except that the branch offices in FIG. **5** does not include a key system or PBX, but rather includes standard telephone instruments (POTS) or a Centrex telephone system. This configuration in the remote office implies that voice data is transferred over the BO LAN **154**. Thus a local extension call is multiplexed on the LAN **154**, and the BO server **160** provides local switching.

As discussed above, in a branch office the user telephony communication device **104** is preferably a rack mounted device referred to as the BO Server **160A**, which includes multiple inputs and which handles multiple phone lines. Each of the branch offices shown in FIG. **5** includes a LAN **154** for connecting multiple computer systems. Each branch office also preferably includes a BO server **160A** corresponding to the LAN **154**. The BO server **160A** provides telephone connectivity for telephones **124** in the branch office.

As shown, each of the computers **102** in the branch office are connected to the respective remote office LAN **154**, and each LAN **154** in turn connects to a respective BO Server **160A**. Each BO Server **160A** connects to the corporate office virtual presence server (virtual presence server) **107A**, and to the corporate office PBX **112**, via the public switched telephone network (PSTN). The computers **102** in the remote office connect through a respective BO Server **160A**, and the BO Server **160A** connects to the PSTN using a communications device and/or media such as analog modems/phone lines, ISDN service, DDS (digital data service) or leased lines, such as T1 lines, among others. The PSTN connects to the corporate office virtual presence server **107A** via one or more communications devices and/or media such as ISDN, DDS, T1 lines, or analog V.34 modems, and the PSTN connects to the corporate PBX via PBX—Central Office phone lines, as is well known.

As discussed above with reference to FIG. **3**, in FIG. **5** the virtual presence server **107A** at the corporate office connects to the corporate PBX **112** via PBX lines. The corporate PBX **112** connects to various telephone instruments **122** in the corporate office, as is well known. The virtual presence server **107A** also connects to the corporate local area network (LAN) **114**. As shown, the corporate LAN **114** may comprise an Ethernet network **132**, a Token Ring network, or other local area network, as desired. Various computer systems **134** are connected to the LAN **114**, as is well known.

As discussed above, the virtual presence server **107A** which interfaces to users in a branch office is preferably different than the virtual presence server (FIG. **3**) **106** which interfaces to telecommuters and road warriors due to the need of the virtual presence server **107A** to interface to the BO Server in the remote office via multiple communication paths. In the embodiment of FIG. **5**, if telecommuters and road warriors desire to remotely connect to the corporate office, then the corporate office preferably includes a separate virtual presence server **106A** dedicated to the telecommuters and road warriors, as discussed above. Alternatively, the virtual presence server **106A** includes functionality for one or more branch offices, telecommuters, and road warriors.

In a branch office application, the BO server **160A** supports telephone connectivity, wherein a user in the remote office is not required to "back-call" telephone calls to other users in the remote office. In other words, for a user in the remote office to call a user next door in the remote office, the user is not required to call the corporate office and then have the virtual presence server in the corporate office call back to the next door user in the remote office.

In one embodiment of FIG. **5**, the computer systems **102** further comprise DSVD (digital simultaneous voice and data) modems as well as the appropriate software for enabling simultaneous voice and data transmissions. As discussed further below, one embodiment preferably utilizes a novel protocol for multiplexing multiple data types on a single communications line, including two or more of voice, LAN data, fax data, and telephony control data.

FIG. **6**—User Telephony Communication Device

Referring now to FIG. **6**, a diagram illustrating the user telephony communication device **104** (FIG. **2**), shown here implemented as PC Card **40**, according to the one embodiment of the present invention used with portable computer system **102** is shown. As shown, the portable computer system **102** includes a video screen **22**, a keyboard **24**, mouse **26**, and a floppy drive **28**. The computer system **102** also preferably includes a microphone **34** and speaker **32**. The computer system **102** further includes at least one PCMCIA slot **30** for receiving a PC Card.

In this embodiment the user telephony communication device **104** is preferably configured as a PCMCIA (Personal Computer Memory Card International Association) PC Card **40** adapted for insertion into the PCMCIA slot **30** of the computer system **102**. This allows the user telephony communication device **104** to be easily used with portable and laptop computer systems. However, it is noted that, for desktop or tower systems, i.e., nonportables, the user telephony communication device **104** may also be configured as an expansion card for insertion into an expansion bus of the computer system. The user telephony communication device **104** may also be configured directly on the motherboard of the computer system **102**. The user telephony communication device **104** may have other physical configurations, as desired.

As mentioned above, the user telephony communication device **104** may be adapted for communicating through various communication mechanisms. For example, in one embodiment, the user telephony communication device **104** is an analog unit including a modem for interfacing to an analog phone line. In another embodiment, the user telephony communication device **104** includes an ISDN terminal adapter unit for interfacing to an ISDN line. The user telephony communication device **104** may also be configured for other types of communication mechanisms, such as ATM, and T1 lines, among others.

FIG. **7** is a block diagram of one embodiment of the user telephony communication device **104** including an analog modem **184**. As shown, the user telephony communication device **104** preferably comprises a V.34 modem **184** and also includes a full-duplex speakerphone **204**. The analog user telephony communication device **104** also preferably

includes simultaneous voice and data (SVD) logic **208** for performing SVD capabilities. The SVD logic **208** operates with the modem **184** and with the full-duplex speakerphone **204**. The SVD logic preferably multiplexes a plurality of data types in a single communication channel, such as voice, LAN data, fax data, and telephony control data.

The analog user telephony communication device **104** also preferably includes digital simultaneous facsimile (DSF) logic for performing DSF capabilities. The user telephony communication device **104** preferably includes a phone jack **212** for connecting to an analog phone line, or telco line. The user telephony communication device **104** also preferably includes external jacks **214** and **216** for an external microphone and speaker, respectively, one or more jacks for pass through of microphone and speaker to a computer sound system (not shown), and a jack for an external phone (not shown).

FIG. **8** illustrates an ISDN embodiment of the user telephony communication device **104**, wherein the user telephony communication device **104** is adapted for ISDN capability. In this embodiment, the user telephony communication device **104** comprises an card ISDN terminal adapter (TA) **182** adapted for coupling to an ISDN line, i.e., which generates one or more 64 Kbps ISDN B channels. The ISDN terminal adapter **182** preferably includes logic for digitally encoding the voice signal, for example, performing 32 kilobyte analog to digital pulse code modulation (ADPCM). The ISDN user telephony communication device **104** preferably includes a full-duplex speakerphone **204**, as well as digital simultaneous voice and data (DSVD) logic **209** for performing DSVD capabilities. The DSVD logic **209** preferably provides or multiplexes a plurality of data types on one or more ISDN B channels, including voice data, LAN data, fax data and telephony control data.

The ISDN user telephony communication device **104** also preferably includes digital simultaneous facsimile (DSF) logic **206** for performing DSF capabilities. The ISDN user telephony communication device **104** also preferably includes an external jack **218** for connecting to an ISDN line, one or more jacks **214** and **216** for an external microphone and speaker, respectively, one or more jacks for pass through of a microphone and speakers, such as to the computer sound system (not shown), and a jack **212** for connecting to an analog phone line.

It is noted that the user telephony communication devices **104** shown in FIGS. **7** and **8** are designed for telecommuters and road warriors. A BO server **160** used for a branch office is preferably similar to either the embodiments of FIGS. **10** and **11**, but includes additional functionality for providing LAN access at the branch office and also providing local PBX extensions between the plurality of workers at the branch office, as discussed above, as well as additional inputs and outputs and communication devices.

FIG. **9** is a conceptual diagram illustrating the operation of the modem **184** of FIG. **7**. As shown, the modem **184** is adapted for transmitting and/or receiving data having various different data types. For example, one or more of analog phone signals (voice), LAN data, fax data, telephony control data, and other data is provided through a multiplexer to the modem **184**. The modem preferably transmits the multiple data types over a single communication media, such as a telephone line. The modem **184** preferably statistically time division multiplexes the data on the phone line in individual packets for each data type. Thus the modem **184** creates a plurality of virtual channels on the single physical channel. The modem **184** also receives data of different data types from a phone line and intelligently distributes the data within the computer system.

FIG. **10**—Virtual Presence Server

The virtual presence server **106** preferably comprises a computer system which connects to the LAN **114** and which also connects to the corporate office PBX **112**. The virtual presence server **106** preferably comprises a high performance computer system executing the Windows NT operating system. In other words, the virtual presence server **106** is preferably a Windows NT server. The virtual presence server **106** may also comprise a UNIX server or may execute other operating systems, as desired. The virtual presence server **106** preferably includes a plurality of communications interfaces, as shown in FIG. **2**. In one embodiment, the virtual presence server **106** includes a plurality of modems **184** which correspond to a plurality of phone lines. The virtual presence server **106** also preferably includes one or more ISDN terminal adapters **182** which connect to a corresponding one or more phone lines.

The virtual presence server system **106** provides a remote user with a virtual presence to a data site or corporate office, wherein the data site or corporate office includes a first telephone number associated with the remote user which is used to access the remote user at the data site. The virtual presence server system comprises a plurality of inputs **348** for coupling to a transmission media. One or more of the plurality of inputs **348** receive communications from a user telephony communications device **104** operated by the remote user, wherein the user telephony communications device **104** is physically located remotely from the virtual presence server system **106**.

The virtual presence server **106** includes a memory **344** for storing identification information received from the user telephony communications device **104**. The virtual presence server **106** also includes a communication device **340** coupled to the memory **344** for providing voice and data information to the user telephony communications device **104**. The virtual presence server **106** further includes processing logic **346** for accessing and verifying identification information received from the user telephony communications device **104**, as well as other operations. The virtual presence server **106** further includes call forwarding logic **342** for performing remote call forwarding and/or remote access call forwarding operations using the identification information.

As discussed below, the virtual presence server **106** is operable to perform a remote call forwarding operation to forward telephone calls made to the first telephone number which are intended for the user at the data site. The remote access call forwarding operation directs the telephone calls made to the first telephone number to be forwarded to the virtual presence server **106**. The virtual presence server **106** is operable to route the telephone calls to the first telephone number and forwarded to the virtual presence server **106** to the user telephony communications device **104**. In other words, the user telephony communications device **104** includes a second telephone number which is usable to access the user telephony communications device **104**, and the virtual presence server **106** is operable to forward or route telephone calls made to the first telephone number to the second telephone number.

In addition, where a second telephone number is used to access the user telephony communications device **104**, the virtual presence server is operable to perform a remote access call forwarding operation to forward telephone calls made to the second telephone number which are intended for the user telephony communications device **104**. The remote access call forwarding operation directs the telephone calls to the second telephone number to be forwarded to the first

number at the data site and/or to the virtual presence server. The virtual presence server **106** is thus operable to receive telephone calls made to the second number and forwarded to the data site, and the virtual presence server **106** is operable to route the telephone calls made to the second telephone number and forwarded to the virtual presence server **106** to the user telephony communications device **104**.

As shown in FIG. 2, and as discussed above, the system of the present invention in one embodiment includes a remote access server in addition to the virtual presence server **106**. Alternatively, the system includes a bridge router in addition to the virtual presence server **106**. In another embodiment, the system includes the remote access server and a bridge router in addition to the virtual presence server **106**, depending on the capabilities of the user telephony communication devices **104** which contact the virtual presence server **106**. In yet another embodiment, the virtual presence server **106** implements the remote access functionality. In one embodiment, the virtual presence server **106** is a SCSA (Signal Computing System Architecture) or MVIP call server in addition to acting as a virtual presence server.

Data Transfer Protocol

FIG. 11A illustrates a standard DSVD hardware model according to the prior art. As shown, the standard DSVD hardware model comprises a CPU executing software which performs a modem protocol, such as the V.42 protocol or the V.60 protocol. The CPU executing software is represented as a box which includes a V.60 block **246**. The computer system includes a COM port **242** which provides data through a serializer **244** to the V.60 block **246**. The CPU executing the V.60 protocol, i.e., the V.60 block **246**, receives data from and provides data to the serial COM port **242**. The computer system includes a microphone **264** and speakers **266** which provide analog audio data through a codec **262** to voice compression logic **260**. The voice compression logic **260** provides compressed audio output to the V.60 block **246**.

The DSVD modem includes a first phone jack **254** for connecting to an external communication mechanism, i.e., a phone line, and a second phone jack **258** for connecting to a telephone instrument. The second phone jack **258** connects to a phone interface controller (PIC) **256** which provides control data to the V.60 block **246**. The V.60 block couples to a DSP **248** and then to a codec **250**. The codec **250** and the PIC **256** connect to block **252** which then connects to phone jack **254**. The phone jack **254** provides analog data output to an analog phone line and receives analog data from the phone line.

When the DSVD modem receives data from the phone line, the data is received by the phone jack **254** and is provided through the codec **250**, the DSP **248**, the V.60 block **246** and the serializer **244** to the COM port **242**. The data received by the phonc jack **254** is also provided through the PIC **256** to the telephone instrument **258**. Data is also provided from either the COM port **242** or the telephone instrument jack **258** to the external phone jack **254** in an opposite manner.

Simultaneous voice and data (SVD) modems differ from standard modems in that they require multiple channels created between the two connected modems. SVD modems require a first channel to carry data and a second channel to carry voice. In one embodiment of the present invention, as discussed below, the modems comprised in the user telephony communication device **104** and in the virtual presence server **106** include first and second channels for data and voice, and a third channel between the modems for extending PBX interfaces.

Modem Architecture—Present Invention

FIG. 11B illustrates an architecture for the modem comprised in the user telephony communication device **104** according to one embodiment of the present invention. Elements which are preferably identical to elements discussed above with reference to FIG. **10** have the same reference numerals for convenience. It is noted that the user telephony communication device **104** in the remote computer system **102** may comprise various types of communication devices, including modems and ISDN terminal adapters. The description below presumes that an analog modem is comprised in the user telephony communication device **104**.

The present invention preferably maintains multiple virtual COM ports which interface to one or more real or physical COM ports. As shown, the present invention includes a CPU executing software which performs the V.60 protocol. The CPU also executes software which performs a virtual COM port multiplexing (V.MUX) function. The CPU executing software is represented as a box which includes a V.60 block **246** and a V.MUX block **274**.

As shown the computer system implements multiple virtual COM ports which are provided to a single physical COM port **242**. The COM port **242** connects to a serializer **244** which connects to a virtual COM port multiplexer **274** referred to as V.MUX. The V.MUX block **274** connects through a data path to the V.60 logic. The V.MUX block **274** also connects through a control path to the V.60 block and a phone interface controller **256**. The CPU executing the V.60 protocol, i.e., the V.60 block **246**, receives data from and provides data to the serial COM port **242**.

The computer system includes a microphone **264** and speakers **266** which provide analog audio data through a codec **262** to voice compression logic **260**. The voice compression logic **260** provides compressed audio output to the V.60 block **246**. The codec **262** also connects to the PIC **256**, which connects to a telephone instrument phone jack **258**.

The modem includes a first phone jack **254** for connecting to an external communication mechanism, i.e., a phone line, and a second phone jack **258** for connecting to a telephone instrument. The second phone jack **258** connects to the phone interface controller (PIC) **256** which provides control data to the V.60 block **246**. The V.60 block **246** couples to a DSP **248** and then to a codec **250**. The codec **250** connects to block **252** which then connects to phone jack **254**. The phone jack **254** receives and provides analog data output to an analog phone line. Thus, the V.60 block **246** receives data from a serial COM port **242** as well as control data from the PIC **256** and audio data from the voice compression logic.

When the modem receives data from the phone line, the data is received by the phone jack **254** and is provided through the codec **250**, the DSP **248**, the V.60 block **246** and the serializer **244** to the COM port **242**. The data received by the phone jack **254** is also provided through the PIC **256** to the telephone instrument through the jack **258**. Data is also provided from either the COM port **242** or the telephone instrument jack **258** to the external phone jack **254**. When data is provided from the phone jack **254** to the COM port **242**, the CPU multiplexes this data with other data streams which may be provided to the COM port **242**, as represented by the V.MUX block **274**. Thus the computer system creates multiple virtual COM ports or channels in software which share the single physical COM port. Likewise, when data is provided from the COM port **242** to the phone jack **254**, the V.MUX block **272** multiplexes this data with other data streams from multiple virtual com ports.

The present invention preferably includes a plurality of protocols, i.e., two or more protocols, which connect the virtual presence server **106** and the remote computer system **102**. The preferred embodiment preferably creates three channels between the virtual presence server **106** and the remote computer system **102** to allow data and voice transmissions, as well as the transfer of telephony control data, i.e., PBX extension data. Thus the third channel is reserved for telephony control data between the virtual presence server **106** and the remote computer system **102**.

DSVD is currently defined to support a protocol that simultaneously carries voice and carries data at the same time. G.dsvd defines two channels of voice and data. A standard referred to as T-120 includes a virtually unlimited number of self creating logical channels and a standard referred to as H-124 includes 20 or more channels. Thus the preferred embodiment uses the T-120 standard to allow three or more channels between the virtual presence server and the remote computer system. In an alternate embodiment, the data channel runs a network protocol such as NETBEUI, IPX, or TCP/IP, which provides a plurality of logical channels, one of which serves as the telephony control channel

Therefore, the present invention creates multiple logical channels between two modems over a single analog line, preferably using time multiplexing techniques. The present invention also creates multiple channels between the modem and the PC itself using multiple virtual COM ports which interface to a single physical COM port.

Thus, multiple channels are created between the remote computer system and the virtual presence server. In one embodiment, the method creates multiple COM port addresses and COM drivers. Currently, when a software application uses or takes control of a modem, the modem is not available for other software applications. Thus the present invention creates a plurality of virtual COM ports. This allows software applications to use virtual COM ports and thus effectively share a single physical COM port.

When a software application makes a call which requests a modem, virtual com port software executing on the remote computer system **102** determines if the software application should be granted access to a virtual COM port of the modem. It is noted that the COM port is not required to be a real COM port. These plurality of virtual COM ports preferably each reference a channel in the communication line. If access is allowed, then the application is allowed a channel on the communication mechanism. The VMUX block **272** multiplexes these data accesses to the physical COM port **272**.

Under Windows, Windows NT, UNIX, and other modem operating systems, the present invention creates multiple virtual software COM ports with no hardware implications. In an alternate embodiment, the computer system includes multiple physical hardware COM ports.

The protocol of the present invention operates to extend the PBX features to the remote users, as well as manage the PBX features used by the remote users. The present invention also combines voice and data transmissions. The combined voice and data transmissions are preferably very compressed. Alternatively, the combined voice and data transmissions are "spoofed" to remove extraneous or unneeded data traffic, i.e., maintenance and handshaking traffic.

Modem Architecture—Virtual Presence Server

The modem architecture of a modem in the virtual presence server **106** according to the present invention is preferably similar to conventional modems and may include digital simultaneous voice and data (DSVD) or digital simultaneous voice, data and fax capabilities, as desired.

User Telephony Communication Device—Software

The remote computer system or communication device **102** includes software which interfaces to the user telephony communication device **104** in the remote computer system **102** which allows remote access and virtual presence to the corporate office according to the present invention. The virtual presence software of the present invention preferably resides on the hard disk drive of the computer system **102** and is loaded into system memory during use. The virtual presence software preferably executes in the background of other applications as one or more device drivers, i.e. one or more network drivers. For example, the virtual presence software may comprise a suite of drivers, including a virtual presence protocol driver and a virtual phone application.

The remote computer system **102** preferably uses a virtual network protocol (VNP) to perform a plurality of activities simultaneously. Thus, the remote computer system **102** can automatically connect to the corporate office on an as needed basis.

The user telephony communication device **104** in the remote computer system includes transparent access capabilities to the corporate office LAN **114** as a remote LAN node (RLN). The remote computer system **102** preferably includes NDIS and/or ODI drivers for Microsoft and Novel local area networks.

The remote computer system **102** also preferably includes transparent access capability to the corporate office telephone system or PBX **112** as an extension telephone set. As mentioned above, the computer system **102** preferably includes an external telephone instrument which connects through the computer system to the user telephony communication device **104**. Alternatively, or additionally, software executing on the remote computer system implements a virtual phone on the computer screen, as desired. The external telephone set is preferably used in situations where privacy is desired.

The user telephony communication device **104** according to the present invention also provides the remote user with transparent access capability to the corporate office telephone system for faxing capabilities. Thus, data is transferred from the remote computer system to the corporate office telephone system and a fax protocol is applied to the data when the data is received at the corporate office, i.e. the data is locally modulated and demodulated depending upon the direction of the facsimile transmission.

FIG. **12**—User Telephony Communication Device Operation

Referring now to FIG. **12**, a flowchart diagram illustrating operation of the virtual presence software executing on the remote computer system according to the present invention is shown. In step **502**, in response to user input, the remote computer system establishes a connection to the host system, i.e., to the virtual presence server at the corporate office. In the preferred embodiment, the virtual presence software presents a graphical user interface (GUI) on the screen, including an icon titled "Be There."

The user preferably clicks the mouse on the "Be There" icon to establish a connection between the remote computer system and the corporate office. Clicking the mouse button on the "Be There" icon invokes an autodial routine, and the autodial routine operates to provide a connection between the remote computer system and the corporate office. Alternatively, the user can initiate the autodial program routine from the operating system command line by typing in a respective command. This may be done in GUI-based operating systems, or in non-GUI operating systems, such as DOS.

It is noted that various telephone service set-up sequences may be performed before autodialing the virtual presence server **106**, such as canceling call waiting. Also, the user telephony communication device or the virtual presence server **106** may instruct the telephone company Central Office to automatically route all calls made to the remote user's home number to the corporate office. Thus external parties who call the telecommuter's home phone number, i.e., personal calls, are routed to the corporate office, through the virtual presence server, and to the telecommuter at his home. The external party calling the telecommuter at his home will not be aware that the call was routed in this fashion.

In another embodiment, designed for telecommuters, when the user enters his office at his home or house and turns on his computer, the computer automatically executes a routine which connects to the virtual presence server **106** at the corporate office.

The entire telephone number used by the virtual presence software to call the host is preferably stored in memory and then automatically dialed. According to the preferred embodiment of the invention, the virtual presence software also provides the option for the user to manually enter, a telephone number to establish a connection to the corporate office. This is necessary due to the various prefixes that may be required to obtain an outside telephone line from hotels and airports, etc. This option of allowing the user to manually enter the telephone number also provides the user with the ability to access alternative long distance carriers using calling cards. The virtual presence software also provides temporary storage of the manually entered number for repeat use.

After the telephone number has been dialed and the remote computer system makes contact with the host system or virtual presence server **106** at the corporate office, in step **504** the remote computer system **102** transfers security information according to a security protocol to the virtual presence server **106** at the corporate office. Thus, identification is preferably exchanged for security. In the preferred embodiment, the user manually enters a password which is received and analyzed by the host system virtual presence server **106**.

The system of the present invention performs telephony functions through computer system **102** to access the corporate office, and thus the computer system **102** can perform various modem authentication techniques. For example, the remote computer system **102** may utilize a unique code hard-wired into the communications device, e.g., modem, encryption of unique random numbers, and the use of credit cards with passwords which periodically change. Thus the present invention facilitates more secure voice telephony authentication than prior voice systems. In other words, the present invention provides more secure computer-based authentication for voice, telepresence, virtual presence, and remote access call forwarding (RACF) applications.

After security negotiations have taken place in step **504**, in step **506** the virtual presence software informs the virtual presence server **106** of the telephone number where the remote computer **102** is connected. The remote unit preferably utilizes caller ID information or uses other means to provide the telephone number where the remote computer is located. This telephone number can be used by the virtual presence server **106** to place a call to the current location where the remote computer **102** is physically located. This telephone number information received by the host virtual presence server **106** is stored by the virtual presence server **106** for the duration of the session.

After the proper security information and identity information have been transferred, in step **508** the remote computer system **102** receives a signal from the virtual presence server **106** indicating if the request for virtual presence has been accepted. If so, then in step **510** virtual presence is enabled. If not, i.e., if the wrong security information or caller information was transferred, then operation returns to step **502**.

Once virtual presence has been enabled, the corporate PBX **112** preferably transmits telephony control data to the phone connected to the remote computer system **102** (or the virtual phone), including message indications, line indications, and LCD display information, etc. Thus the phone connected to the remote computer system **102** appears as an extension of the corporate PBX **112**, just as if the phone were physically present at the corporate office.

FIG. **13**—Virtual Presence Server Operation

Referring now to FIG. **13**, a flowchart diagram illustrating operation of the virtual presence software executing on the virtual presence server **106** according to the present invention is shown. It is noted that the steps in FIG. **13** may occur in various orders, as desired.

In step **522** the virtual presence server **106** receives a call from the remote computer system **102**, wherein the call is made by the remote computer system in step **502** of FIG. **12**. In step **524** the virtual presence server **106** receives security information from the remote computer system **102**, wherein the security information is transferred by the remote computer system **102** in step **504** of FIG. **12**.

In step **526** the virtual presence server **106** receives identification information from the remote computer system **102** which indicates how the remote computer system **102** can be accessed. In the preferred embodiment, the virtual presence server **106** receives caller ID information from the PSTN indicating the source telephone number. It is noted that this step of receiving caller ID information actually occurs in step **522** when the call is received. Alternatively, step **526** involves receiving other types of identification information in addition to, or instead of, caller ID information.

In response to receiving the call and the security information, in step **532** the virtual presence server **106** determines if the call is valid, i.e., if the security data or password is valid and the caller identification is valid. This step of validating the caller ID information preferably involves determining if the source of the call matches a database of valid callers. This embodiment is preferably used for telecommuters and workers in a branch office where the source of telephone calls to the virtual presence server **106** in the corporate office is predictable and thus can be regulated.

If the security data or password is not valid, or the caller identification information is not valid, then the virtual presence server **106** refuses access to the caller. The virtual presence server **106** also preferably logs the identity of the caller using caller ID information, and operation returns to step **522**. In one embodiment, step **526** occurs after step **532** and only the security data or password is used to validate callers.

After validation in step **532**, in step **534** the virtual presence server **106** transfers a message to the corporate PBX **112** to instantiate remote call forwarding. The virtual presence server **106** issues a command to the PBX **112** regarding the virtual presence of the remote user. It is noted that this command to the PBX **112** may be issued automatically or manually. The command includes the instruction to forward all telephone calls made or destined to the extension

of the remote user at the corporate office to the virtual presence server **106**. When the virtual presence server **106** receives calls forwarded from the user's corporate office extension, the virtual presence server **106** operates to route these calls to the location of the remote user at his "virtual office." Thus external parties who call the user at the office are automatically routed to the user's remote location, thus providing the "virtual presence".

If the PBX **112** supports remote call forwarding, the virtual presence server **106** issues a sequence of tones, and hookflash if needed, on the line to the PBX **112** that direct the PBX **112** to forward the remote user's extension to the virtual presence server **106**, so that these calls can then be routed to the remote user's actual location. It is noted that the virtual presence server **106** automatically issues a command to the corporate PBX **112** to perform the remote call forwarding where possible. It is noted that most PBXs, as well as the TAPI (Telephony Application Programming Interface) from Microsoft and the TSAPI (Telephony Application Programming Interface) from Novell and AT&T, support remote call forwarding.

However, in embodiments where the PBX **112** does not support remote call forwarding, but rather has a master console, the PBX **112** is manually commanded to forward calls to the remote user. In one embodiment where the PBX **112** does not support remote call forwarding, a computer system is included between the virtual presence server **106** and the PBX **112**. A human operator at the computer system receives a message from the virtual presence server **106** such as "please forward extension X to extension Y", and the operator manually enters commands to enable the call forwarding. Alternatively, the virtual presence server **106** includes a side path, such as a serial port, to the master console which enables remote call forwarding. However, it is noted that in the majority of instances the PBX **112** will generally support remote call forwarding, and in these instances the PBX **112** automatically routes calls to the virtual presence server **106**, which then provides these calls to the remote user.

In one embodiment preferably used for telecommuters, the virtual presence server **106** also instructs the telephone company Central Office to automatically route all calls made to the remote user's home number to the user's corporate office phone number and/or the virtual presence server **106**. Thus external parties who call the telecommuter's home phone number, i.e., personal calls, are routed to the corporate office, through the virtual presence server **106**, and to the telecommuter at his home. The external party calling the telecommuter at his home will not be aware that the call was routed in this fashion.

If the remote user disconnects from the corporate office, or if the user is intentionally or unintentionally disconnected, then the reverse process to step **534** preferably occurs. In other words, the virtual presence server **106** automatically sends a message to the console to forward future messages back to the user's corporate office extension.

Also, after validation in step **532**, in step **536** the virtual presence server transmits telephony control data to the remote computer system, as discussed above.

FIG. **14**—Connection Options

Referring now to FIG. **14**, a flowchart diagram illustrating various connection options of the system of the present invention is shown. Once the remote computer system has established a connection to the virtual presence server **106**, as described above with reference to FIGS. **12** and **13**, in step **542** the virtual presence software operating in the remote computer system **102** preferably determines if message rate charging is in effect for the connection. In step **542** the remote computer system **102** determines if the corporate office and the remote user reside in a common Local Access Transport Area (LATA) that has no message unit transport charging. If so, then in step **544** the remote computer system **102** remains connected until the user manually disconnects, and thus the user preferably remains connected as long as desired. Thus, if the user resides within a local area code to the corporate office, and no message unit charging is in effect, the user preferably remains connected during the entire session, since there are no message unit charges.

If the corporate office and the remote user are determined in step **542** to not reside in a common Local Access Transport Area (LATA) and/or message unit transport charging is incurred, then in one embodiment the system of the present invention periodically disconnects during non-use or inactive periods to reduce connection expenses. In step **546** the virtual presence software sets an inactivity disconnect timer in the remote computer system. In step **548** the virtual presence software monitors the state of the timer as well as connection activity. Preferably, the timer counts down and generates an interrupt when the counter reaches 0. If in step **550** the virtual presence software determines that there has been no activity during the timeout period, then in step **552** the virtual presence software directs the remote computer system to disconnect from the virtual presence server **106**. If activity has occurred during the timeout period, then operation returns to step **546**, and the inactivity timer is reset. Thus, when connection activity occurs, the inactivity timer is reset accordingly and begins counting down.

Therefore, in one embodiment, a session established over long distance links or in areas where message unit charging is in effect is disconnected and reestablished based upon utilization in order to reduce costs. According to the present invention, the remote computer system includes a timer which is enabled during a session. The timer causes a link to be disconnected after a user determined period of no link activity. This type of disconnection is referred to as a "temporary disconnect" and is not apparent to the user. In the preferred embodiment, it is anticipated that the remote user will remain connected with a virtual presence at the corporate office for extended periods of time, regardless of any message unit charging.

The present invention also preferably operates to minimize LAN data traffic. ISDN is a message rate service where a user pays a set fee per minute. Bridges or routers between two LANs continually "ping" each other, asking each other if they are still connected to the network. In the preferred embodiment, the BO server **160** and the virtual presence server **106** perform spoofing to remove this traffic, as well as remove maintenance and overhead traffic.

FIGS. **15** and **16**—Virtual Presence Operation

Referring now to FIG. **15** a flowchart diagram is shown illustrating operation of the present invention when the remote user accesses the corporate office. The flowchart of FIG. **15** presumes that virtual presence has been enabled as shown in step **510** of FIG. **12**. In step **562** the remote user enables the communication device in the remote computer system **102**. This may involve the user picking up the telephone connected to the remote computer system **102** or placing the virtual telephone "off-hook" to begin a telephone call. This may also involve the user initiating a modem or ISDN data transmission, initiating an Internet session, checking office email, etc.

In step **564** the virtual presence software executing on the remote computer system **102** determines if the remote

computer system **102** is connected to the virtual presence server **106**. If not, then in step **566** the virtual presence software automatically dials the corporate office. In step **568** the virtual presence software establishes a connection with the virtual presence server **106**. Here it is noted that the connection is established as quickly as possible, and the security negotiations performed in step **504** of FIG. **12** are preferably not performed, with the possible exception of a reconnect password. In step **570** the remote computer system **102** performs the desired function at the corporate office, such as checking or sending email, calling an external party, or accessing the Internet, among others.

Referring now to FIG. **16** a flowchart diagram is shown illustrating operation of the present invention when a party at the corporate office or elsewhere accesses the remote user. The flowchart of FIG. **16** presumes that virtual presence has been enabled as shown in step **510** of FIG. **12**. In step **582** the virtual presence server **106** receives a communication from a party intended for the remote computer system **102**. This may involve a co-worker at the corporate office dialing the local extension of the remote user, an external person or external party calling the remote user from outside the corporate office, a party sending an email or fax to the remote user, or other forms of communication. This may also involve the third party initiating a modem or ISDN data transmission to the remote user.

In step **584** the virtual presence software executing on the virtual presence server **106** determines if the remote computer system **102** is connected to the virtual presence server **106**. If not, then in step **586** the virtual presence server **106** automatically dials the remote computer system **102**, i.e., establishes a connection or places a call to the remote computer system. Once the virtual presence server **106** at the corporate office connects to the remote user, the virtual presence server **106** "knows" the identity of the remote user. In step **588** the virtual presence server **106** establishes a connection with the remote computer system **102**. Here it is noted that the connection is established as quickly as possible, and the security negotiations performed in step **504** of FIG. **12** are preferably not performed. In step **590** the virtual presence server **106** performs the desired function or transfer to the remote computer system **102**, such as sending an email transmitted from a third party, transferring or forwarding a call made by a third party, forwarding a fax message received from a third party, among others.

In systems where inactivity disconnects occur, the virtual presence server **106** preferably generates special tones or uses other means to distinguish the virtual presence server **106** calling the remote user versus a call from a third party directly to the remote user. In the preferred embodiment, caller ID information is used by the virtual presence software executing on the remote computer system to distinguish between calls from the virtual presence server **106** and calls from third parties directly to the remote user's remote location. The caller ID information is used by the remote computer system **102** between the first and second ring before the receiving telephone has come off-hook. This allows the remote computer system to immediately determine if the call is from the virtual presence server **106** or from somebody else.

If the remote computer system does not have access to caller ID, the telephone at the remote site comes off-hook and waits for one second and then listens for special tones. In this embodiment, the virtual presence server **106** preferably generates special tones or unique identifying tones in a similar manner to the tones generated by a fax machine. In another embodiment, the virtual presence server **106** uses V8.bis, which provides for user-defined calling tone fields.

Therefore, after a temporary disconnect, any virtual presence accoss by the remote computer system **102**, whether using the telephone, accessing the LAN, or other functions, causes the link to be automatically redialed by the virtual presence software executing in the remote computer system. This reduces message unit charging costs while preferably being transparent to the user. Likewise, any accesses by a third party intended for the remote user cause the virtual presence server **106** to automatically re-establish the connection with the remote computer system **102**. After the reconnection, the third party communications are automatically directed to the remote user. Thus if the user picks up the telephone or engages the virtual telephone on the remote computer to initiate a call, and if a temporary disconnect has occurred, the remote computer system **102** automatically dials the virtual presence server **106** to reconnect. Also if a PBX extension at the corporate office and assigned to the remote computer system rings at the corporate office, and a temporary disconnect has occurred, the virtual presence server **106** at the corporate office automatically redials the remote computer system to reestablish the link. In this latter case, the virtual presence server **106** uses the telephone numbers provided by the remote virtual presence software at the beginning of the session and stored by the virtual presence server **106** during the initial session negotiation.

It is noted that, on an ISDN link, re-establishment of a connection after a temporary disconnect occurs very quickly and is typically less than a second. Thus on an ISDN link, re-establishment of a connection is generally transparent to the user. However, re-establishment of analog links using V.34 modems typically requires over 40 seconds. Thus, in an embodiment where analog phone lines are used, the automatic disconnect feature is noticeable and preferably not used.

Remote User Connected to Virtual Presence Server

The following describes operations wherein a remote user accesses data and/or performs communications using the virtual presence server **106** at the corporate office. Here it is assumed that the remote user desires to make a telephone call or otherwise communicate with a third party, wherein the remote user behaves just as if he were physically located at the corporate office.

As shown in FIG. **15**, first in step **562** the remote user initiates a communication, i.e., picks up the telephone, or in some manner enables the telephone or modem to become "off-hook". For example, if the user is using a virtual telephone executing on the remote computer system, the user clicks a telephone call icon on the virtual telephone. If the remote user is connected to the virtual presence server **106** in step **564**, or after a connection is established in step **568**, then the following steps occur. In step **570** the corporate PBX **112** provides a dial tone to the remote user. The corporate PBX **112** provides the dial tone through the virtual presence server **106**, through the public switched telephone network (PSTN) and through the open connection to the user's telephone instrument, or to the user's virtual telephone executing on the computer system **102**. Thus the corporate PBX **112** provides the dial tone to the remote user's telephone, and the remote user acts as an extension to the corporate PBX **112**.

If the user is performing a telephone call, then the user dials the desired number. If the remote user desires to talk to a co-worker at the corporate office, the remote user dials the coworker's three digit (or other type) extension. If the remote user dials a co-worker who is also a remote user that maintains a virtual presence, then the call is routed from the corporate office virtual presence server **106** to the co-worker

remote user. If the remote user desires to talk to a third party using the corporate office WATTS line, the remote user dials just as if he/she were physically at the corporate office. Therefore, the telephone plugged into the remote computer system and/or the virtual telephone simulated by the remote office software appears as an extension on the corporate telephone system, i.e. the corporate PBX **112**. The remote user also sends a fax or email, or logs on to the Internet, as if he were physically present at the corporate office.

Referring again to FIG. **16**, when a telephone call is made to the user at the corporate office in step **582**, then if the virtual presence connection is in place in step **584**, or after the connection is established in step **588**, in step **590** the PBX **112** and the virtual presence server **106** automatically route the call to the remote user. Thus, when a co-worker at the corporate office dials the local N digit extension of the remote user, which typically rings at the user's "corporate office" office, the telephone call is routed through the PBX **112** and provided through the virtual presence server **106** to the remote user at his/her remote location. The virtual presence server **106** provides the proper tones to the telephone of the remote user to direct the remote user's telephone to ring. The remote user then may pick up or answer the telephone and complete the connection. Likewise, a received email or fax is routed to the remote user in this fashion.

Therefore, once the remote user has been connected to the corporate office, the remote user operates substantially as if the user were physically present at the corporate office. To illustrate operation of the present invention, consider a user who works out of his home and also includes an office at the corporate office. If a user is engaged in a session with the virtual presence server **106** at the corporate office, or otherwise has informed the virtual presence server **106** that the user is physically located at his home, then when an external party attempts to call the user at the corporate office, the PBX telephone system **112** at the corporate office automatically routes the call to the user's home.

Thus, when an external party makes a telephone call to the corporate office to attempt to reach the user, the corporate PBX **112** automatically routes the telephone call through the session created by the user and the telephone rings at the remote computer **102**, i.e. at the telephone plugged into the remote computer system or the virtual telephone simulated by the remote office software. Therefore, an external party calling the user is unable to detect whether the user is actually physically located in the corporate office or in a remote location with a virtual presence according to the present invention.

If the user and the external party are discussing a document and the external party desires to fax the document to the user, the external party faxes the document to the corporate office. If the user has a dedicated phone number for a personal fax at the corporate office, then the virtual presence server **106** of the present invention operates to automatically direct the fax from the corporate office to the user's home. In this case, the external party faxes the document to a fax machine, or to the fax number, at the corporate office which is connected to the virtual presence server **106**, and the virtual presence server **106** detects that remote user as the receiving party of the fax and automatically redirects the fax transmission data from the corporate office fax machine to the remote user's home office.

Thus, according to the present invention, an external party calls the remote user at the corporate office and also faxes a document to the remote user at the corporate office, and both the telephone call and the fax document are automatically redirected to the user's home since the user is physically located at home. This occurs unbeknownst to the external party, who has every reason to believe that the user is physically located in the corporate office.

If the remote user at his home has established a "virtual presence" at the corporate office according to the invention, and desires to make a long distant telephone call to an external party located in a different area of the country, according to the present invention the user simply performs the dialing routine to access the corporate office WATTS line at the corporate office, just as if the remote user were physically located in the corporate office. Thus the remote user can obtain and use the corporate office WATTS line to make a long distance telephone call to an external party at a much reduced rate, just as if the user were physically located in the corporate office.

If a remote user is connected to the corporate office according to the virtual presence system of the invention, the user may be talking on the phone and simultaneously sending a fax. The remote user is also connected through a LAN bridge to the corporate LAN. If the remote user launches an application which expects to use a modem in one embodiment, this opens a channel to a the corporate office which then returns to use the remote user's modem. Thus, the modem located with the remote user is used in the application to dial the on-line service.

In one embodiment the remote user can access a modem from a modem server at the corporate office, and the modem at the corporate office acts as a slave to the remote user modem. Thus the modem at the corporate office performs desired communications, and the remote user's modem is only required for communications to and from the modem at the corporate office.

If a telecommuter desires to receive personal calls at home while connected to the virtual presence server, the telecommuter preferably instructs his friends and family to "call me at the office" to avoid a busy signal as a result of the virtual presence phone connection occupying the phone line. These calls are then routed to the telecommuter's home by the virtual presence server **106**. Alternatively, the virtual presence server **106** and/or the user telephony communication device **104** instructs the telephone company Central Office to automatically route calls to the telecommuter's home number to the corporate office, and these calls are then routed to the telecommuter's home by the virtual presence server **106**. Thus when a telecommuter is connected to the corporate office according to the virtual presence system of the invention, an external party who attempts to call the telecommuter at home is not blocked out, but rather is routed through the corporate office virtual presence server **106** to the telecommuter.

Thus the telecommuter is not required to have separate telephone lines for personal and business use, but rather is required to only have a single line for both personal and business communications. The single telephone line serves as the personal voice channel, the business voice channel, the corporate LAN data channel, and fax data channel.

When the user has completed operations and desires to terminate the session to the corporate office, the user preferably clicks on the "Be There" icon or enters a command at the operating system command line to terminate the remote virtual presence software.

Remote Access Call Forwarding

The present invention also provides a greatly improved system and interface for performing remote access call forwarding. In current systems, remote access call forwarding is not widely used due to the lack of a friendly user

interface as well as the lack of a system which monitors the forwarding history and status of the user. The computer system **102** including the user telephony communication device **104** of the present invention provides an automated means for performing remote access call forwarding. The computer system **102** includes software which provides a friendly user interface that greatly simplifies remote access call forwarding. The computer system **102** also tracks the remote call forwarding status and history of the user, and thus remote access call forwarding can be easily undone. Also, the computer system **102** includes recovery methods for situations where a link has gone down and/or other instances occur where the remote access call forwarding should be done. Further, the computer system **102** includes authentication software as discussed above which provides the necessary security for remote access call forwarding.

FIGS. **17** and **18**—Office Number Call Forwarding Operation

FIG. **17** illustrates a method for providing a remote user operating the user telephony communications device **104** with a virtual presence at a corporate office or data site. The corporate office or data site includes the virtual presence server **106** which routes communications between the corporate office and the telephony communications device **104**. The corporate office or data site includes a first telephone number associated with the remote user, wherein the first telephone number is used to access the remote user at the corporate office or data site. In other words, the first telephone number is the user's office telephone number.

As shown, in step **702** the user telephony communications device **104** connects to the corporate office or data site. In step **704** the user telephony communications device **104** provides identification information to the virtual presence server **106** at the corporate office after connecting to the corporate office. The identification information includes an identity of the user operating the user telephony communications device **104**. In step **706** the virtual presence server **106** stores the identification information provided by the user telephony communications device **104**.

In step **708** the virtual presence server **106** performs a call forwarding operation to forward telephone calls made to the first telephone number which are intended for the user at the corporate office. The call forwarding operation directs the telephone calls made to the first telephone number to be forwarded to the virtual presence server **106**. The virtual presence server performing the remote call forwarding operation includes the virtual presence server accessing the identification information received from the user telephony communications device **104** and then performing the remote call forwarding operation using the identification information.

Referring now to FIG. **18**, when an external party calls the user at the office, i.e., dials the first telephone number to call the user at the office, the call forwarding operation performed in step **708** causes the telephone call to be received by the virtual presence server **106**. As shown, in response to the call made to the first telephone number by the external party, in step **712** the virtual presence server **106** receives the telephone call made to the first telephone number and forwarded to the virtual presence server **106**. In step **714** the virtual presence server **106** routes the telephone call made to the first telephone number and forwarded to the virtual presence server **106** to the user telephony communications device **104**.

Thus the external party who calls the user at the office is automatically forwarded to the user at the remote location. For example, if the user is at home and is connected to the virtual presence server **106** at the corporate office, calls made to the user's office telephone number are forwarded to the user's home telephone number. Thus if the user telephony communications device **104** includes a second telephone number used to access the user telephony communications device **104**, the virtual presence server **106** routes telephone calls made to the first telephone number to the second telephone number.

FIGS. **19** and **20**—Remote Telephone Number Call Forwarding Operation

FIGS. **19** and **20** are a flowchart diagram illustrating operation of the invention in enabling the remote user to receive calls made to his telephone number while the user is connected to the virtual presence server **106** at the corporate office. Here it is assumed that the user telephony communications device **104** includes a second telephone number which is used to access the user telephony communications device **104**. For example, if the remote user is a telecommuter, the second telephone number is the user's home number.

As shown, in step **722** the user telephony communications device **104** performs a call forwarding operation to call forward telephone calls made to the second number. The call forwarding operation causes telephone calls made to the second number to be forwarded to the virtual presence server **106**. As discussed below, this enables telephone calls made to the second telephone number to be forwarded to the virtual presence server **106** and then routed through by the virtual presence server **106** to the user telephony communications device **104**.

In another embodiment, in step **722** the virtual presence server **106** performs the call forwarding operation to call forward telephone calls made to the second number, causing calls made to the second number to be forwarded to the virtual presence server **106**.

In the preferred embodiment, in step **722** the call forwarding operation directs telephone calls made to the second number to be forwarded to the first number at the corporate office. As noted above, calls intended for the first number at the corporate office are forwarded to the virtual presence server **106**. Telephone calls intended for the first number at the corporate office are forwarded to the virtual presence server **106** due to the call forwarding operation performed in step **708**. Thus, in this embodiment, telephone calls made to the second number are forwarded to the first number at the corporate office, and these calls forwarded to the first number at the corporate office are instead forwarded to the virtual presence server **106** due to the call forwarding operation of step **708**.

After the call forwarding operation is performed in step **722**, when an external party attempts to call the remote user at the remote location, e.g., attempts to call the telecommuter at home, the following occurs. As shown, in step **724**, a party makes a telephone call to the second telephone number of the user telephony communications device. For example, if the remote user is a telecommuter, in step **724** a party makes a telephone call to the user's home.

In response to the call forwarding operation performed in step **722**, in step **726** the telephone call to the second telephone number of the user telephony communications device **104** is automatically routed to the virtual presence server **106** at the corporate office. In step **728** the virtual presence server **106** receives the telephone call made to the second telephone number of the user telephony communications device **104** and forwarded to the virtual presence server **106** at the corporate office. In step **730** the virtual presence server **106** forwards or routes the telephone call

made to the second telephone number of the user telephony communications device **104** and forwarded to the virtual presence server **106** at the corporate office to the user telephony communications device **104**.

The virtual presence server **106** routes the telephone call to the user telephony communications device **104** on the same communication line or telephone line which is being used for the vial presence connection. Thus the single communication line is used for the virtual presence connection as well as for receiving home telephone calls routed in the above fashion.

Conclusion

Therefore, a system which enables a remote user to maintain a virtual presence at a corporate office is shown and described. The system of the present invention thus allows a remote user to connect to a corporate office and behave just as if the user were physically present at the corporate office.

Although the system and method of the present invention has been described in connection with the preferred embodiment, it is not intended to be limited to the specific form set forth herein, but on the contrary, it is intended to cover such alternatives, modifications, and equivalents, as can be reasonably included within the spirit and scope of the invention as defined by the appended claims.

We claim:

1. A method for providing a remote user operating a user telephony communications device with access capabilities to a corporate office, wherein the corporate office includes a virtual presence server, wherein the corporate office includes a first telephone number associated with the remote user and used to access the remote user at the corporate office, the method comprising:

the user telephony communications device connecting to the corporate office on a communication line and providing identification information;

the virtual presence server performing a call forwarding operation to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said virtual presence server; and

the virtual presence server communicating telephony control information with the user telephony communications device on the communication line, wherein said communicating telephony control information enables the user telephony communications device to behave as an extension to a telephony server at the corporate office;

wherein the virtual presence server performs said call forwarding operation and communicates said telephony control information in response to the user telephony communications device connecting to the corporate office and providing said identification information.

2. The method of claim **1**, wherein calls made to said first telephone number which are intended for the user at the corporate office are forwarded to said virtual presence server and transmitted on the communication line to the user telephony communications device.

3. The method of claim **1**, further comprising:

the virtual presence server receiving a telephone call made to said first telephone number and forwarded to said virtual presence server, wherein said telephone call is intended for the remote user operating said user telephony communications device; and

the virtual presence server routing said telephone call made to said first telephone number and forwarded to said virtual presence server to the user telephony communications device on the communication line.

4. The method of claim **3**, further comprising:

the user telephony communications device and the virtual presence server communicating voice information on the communication line after the virtual presence server routing said telephone call;

the virtual presence server performing data transfers with the user telephony communications device on the communication line during the user telephony communications device and the virtual presence server communicating said voice information.

5. The method of claim **1**, wherein the virtual presence server communicates voice and telephony control information with the user telephony communications device on the communication line.

6. The method of claim **1**, wherein the virtual presence server communicates voice, data and telephony control information with the user telephony communications device on the communication line.

7. The method of claim **1**, further comprising:

the virtual presence server performing data transfers with the user telephony communications device on the communication line after the user telephony communications device connecting to the corporate office.

8. The method of claim **7**, further comprising:

the virtual presence server routing electronic mail intended for the remote user to the user telephony communications device on the communication line after the user telephony communications device connecting to the corporate office.

9. The method of claim **7**, further comprising:

the virtual presence server routing faxes intended for the remote user to the user telephony communications device on the communication line after the user telephony communications device connecting to the corporate office.

10. The method of claim **1**, wherein the corporate office includes a local area network, wherein the virtual presence server is coupled to the local area network, the method further comprising:

the virtual presence server routing local area network data intended for the remote user to the user telephony communications device on the communication line after the user telephony communications device connecting to the corporate office.

11. The method of claim **1**, wherein the user telephony communications device includes a second telephone number, wherein the second telephone number is used to access the user telephony communications device, the method further comprising:

performing a call forwarding operation to call forward telephone calls made to said second number to said virtual presence server;

wherein said telephone calls made to the second telephone number and forwarded to the virtual presence server are routed through said virtual presence server to said user telephony communications device on the communication line.

12. The method of claim **11**, further comprising:

a party making a telephone call to the second telephone number of the user telephony communications device;

wherein said telephone call to the second telephone number of the user telephony communications device is automatically forwarded to the virtual presence server at the corporate office;

the virtual presence server receiving said telephone call made to the second telephone number of the user

telephony communications device and forwarded to the virtual presence server at the corporate office;

the virtual presence server routing said telephone call made to the second telephone number of the user telephony communications device and forwarded to the virtual presence server at the corporate office to the user telephony communications device on the communication line.

13. The method of claim 11, wherein the virtual presence server automatically performs said call forwarding operation to call forward telephone calls made to said second number to said virtual presence server in response to the user telephony communications device connecting to the corporate office and providing said identification information.

14. The method of claim 1, wherein the user telephony communications device includes a second telephone number, wherein the second telephone number is used to access the user telephony communications device, the method further comprising:

instructing a telephone company central office to forward telephone calls made to the second telephone number to the virtual presence server at the corporate office;

wherein said telephone calls made to the second telephone number of the user telephony communications device and forwarded to the virtual presence server at the corporate office are routed through said virtual presence server to said user telephony communications device on the communication line.

15. The method of claim 14,

wherein the virtual presence server automatically instructs said telephone company central office to forward telephone calls made to the second telephone number to the virtual presence server at the corporate office in response to the user telephony communications device connecting to the corporate office and providing said identification information.

16. The method of claim 14, wherein said instructing the telephone company central office comprises the virtual presence server performing a remote access call forwarding operation to forward telephone calls made to the second telephone number to the virtual presence server at the corporate office.

17. The method of claim 1, wherein the corporate office includes a corporate office telephone coupled to the telephony server and used by the remote user when the remote user is physically present in the corporate office;

wherein the user telephony communications device behaves substantially like said corporate office telephone in response to the virtual presence server communicating said telephony control information with the user telephony communications device.

18. The method of claim 1, further comprising:

the remote user calling a party using the communication line after said connecting and after the virtual presence server communicates telephony control information with said user telephony communications device, wherein said calling includes the user telephony communications device using said telephony control information to behave as an extension to the telephony server.

19. The method of claim 1, wherein the corporate office further includes a plurality of telephones coupled to said telephony server, wherein each of said plurality of telephones coupled to said telephony server have a local extension, the method further comprising:

the remote user calling a co-worker at the corporate office using the communication line after said connecting and after the virtual presence server communicates telephony control information with the user telephony communications device, wherein said calling the co-worker includes the remote user dialing a local extension of a telephone associated with said co-worker.

20. The method of claim 1, wherein said telephony control information includes one or more of message indications, line indications, and LCD display information.

21. The method of claim 1, wherein said identification information comprises an identity of the remote user operating the user telephony communications device.

22. The method of claim 1, further comprising:

the virtual presence server storing said identification information provided by the user telephony communications device;

wherein said virtual presence server performing said call forwarding operation includes:

accessing said identification information received from said user telephony communications device; and

performing said call forwarding operation using said identification information.

23. The method of claim 1, further comprising:

the user telephony communications device disconnecting from the corporate office;

the virtual presence server performing a discontinue operation to discontinue said call forwarding operation in response to said disconnecting;

wherein after said discontinue operation telephone calls made to said first telephone number which are intended for the user at the corporate office are received by a telephony device at the corporate office associated with said first telephone number.

24. The method of claim 1, wherein the virtual presence server performing said call forwarding operation comprises the virtual presence server instructing the telephony server at the corporate office to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said virtual presence server.

25. The method of claim 24, further comprising:

the user telephony communications device disconnecting from the corporate office;

the virtual presence server instructing the telephony server at the corporate office to discontinue said call forwarding operation;

wherein, after the telephony server at the corporate office discontinues said call forwarding operation, telephone calls made to said first telephone number which are intended for the user at the corporate office are received by the telephony server and not forwarded to the virtual presence server.

26. The method of claim 1, wherein the virtual presence server is also said telephony server.

27. A system which provides a remote user with access capabilities to a corporate office, comprising:

a user telephony communications device physically located remotely from the corporate office, wherein the user telephony communications device is operated by the remote user, wherein the user telephony communications device is adapted for coupling to a transmission medium, wherein the user telephony communications device transmits communications to the corporate office on the transmission medium, wherein said communications include identification information;

a telephony server located at the corporate office, wherein the telephony server controls a plurality of telephones,

wherein the corporate office includes a first telephone number associated with the remote user, wherein the first telephone number is used to access the remote user at the corporate office; and

a virtual presence server located at the corporate office and coupled to said telephony server, wherein the user telephony communications device is operable to connect to the virtual presence server, wherein the virtual presence server includes:

at least one input for coupling to the transmission medium, wherein said at least one input receives communications from said user telephony communications device on the transmission medium;

a memory for storing said identification information received from said user telephony communications device; and

a communication device coupled to said memory and to said at least one input for communicating with the user telephony communications device on the transmission medium;

wherein the virtual presence server is operable to perform a call forwarding operation to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said virtual presence server;

wherein the virtual presence server is operable to route said telephone calls made to said first telephone number and forwarded to said virtual presence server to the user telephony communications device on the transmission medium;

wherein the virtual presence server is operable to communicate telephony control information with the user telephony communications device on the transmission medium, wherein said telephony control information enables the user telephony communications device to behave as an extension to the telephony server at the corporate office; and

wherein the virtual presence server is operable to perform said call forwarding operation and communicate said telephony control information in response to the user telephony communications device connecting to the corporate office and providing said identification information.

28. The system of claim **27**,

wherein the virtual presence server is operable to receive a telephone call made to said first telephone number and forwarded to said virtual presence server, wherein said telephone call is intended for the remote user operating said user telephony communications device; and

wherein the virtual presence server is operable to route said telephone call to said user telephony communications device through the transmission medium.

29. The system of claim **27**,

wherein the user telephony communications device and the virtual presence server are operable to simultaneously communicate voice and data information on the transmission medium.

30. The system of claim **27**, wherein said virtual presence server further includes:

processing logic for accessing said identification information received from said user telephony communications device; and

call forwarding logic for performing said call forwarding operation using said identification information.

31. The system of claim **27**, wherein the virtual presence server is operable to perform data transfers with the user telephony communications device on the transmission medium after the user telephony communications device connects to the corporate office.

32. The system of claim **31**, wherein the virtual presence server is operable to route electronic mail intended for the remote user to the user telephony communications device on the transmission medium after the user telephony communications device connects to the corporate office.

33. The system of claim **31**, wherein the virtual presence server is operable to route faxes intended for the remote user to the user telephony communications device on the transmission medium after the user telephony communications device connects to the corporate office.

34. The system of claim **27**, further comprising:

a local area network located at the corporate office, wherein the virtual presence server is coupled to the local area network;

wherein the virtual presence server is operable to route local area network data intended for the remote user to the user telephony communications device after the user telephony communications device connects to the corporate office.

35. The system of claim **27**, wherein the user telephony communications device includes a second telephone number, wherein the second telephone number is used to access the user telephony communications device;

wherein the virtual presence server is operable to perform a call forwarding operation to call forward telephone calls made to said second number to said virtual presence server at the corporate office;

wherein the virtual presence server is operable to route said telephone calls made to the second telephone number and forwarded to the virtual presence server to said user telephony communications device on the transmission medium.

36. The system of claim **27**, wherein the corporate office includes a corporate office telephone coupled to the telephony server and used by the remote user when the remote user is physically present in the corporate office;

wherein the user telephony communications device behaves substantially like said corporate office telephone in response to said telephony control information.

37. The system of claim **27**,

wherein the corporate office further includes a plurality of telephones coupled to said telephony server, wherein each of said plurality of telephones coupled to said telephony server have a local extension;

wherein the user telephony communications device is operable to call a co-worker at the corporate office through the transmission medium by dialing a local extension of a telephone associated with said co-worker.

38. The system of claim **27**, wherein said telephony control information includes one or more of message indications, line indications, and LCD display information.

39. The system of claim **27**,

wherein the user telephony communications device is operable to disconnect from the corporate office;

wherein, in response to the user telephony communications device disconnecting from the corporate office, the virtual presence server performs a discontinue operation to discontinue said call forwarding operation;

wherein after said discontinue operation telephone calls made to said first telephone number which are intended

for the user at the corporate office are received by a telephony device at the corporate office associated with said first telephone number.

40. The system of claim 27, wherein the virtual presence server is operable to perform said call forwarding operation by instructing the telephony server at the corporate office to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said virtual presence server.

41. The system of claim 40,

wherein the user telephony communications device is operable to disconnect from the corporate office;

wherein, in response to the user telephony communications device disconnecting from the corporate office, the virtual presence server is operable to instruct the telephony server at the corporate office to discontinue said call forwarding operation;

wherein, after the telephony server at the corporate office discontinues said call forwarding operation, telephone calls made to said first telephone number which are intended for the user at the corporate office are received by the telephony server and not forwarded to the virtual presence server.

42. A system which provides a remote user with access capabilities to a corporate office, wherein the system is located at the corporate office, wherein the remote user operates a user telephony communications device physically located remotely from the corporate office, wherein the corporate office includes a first telephone number associated with the remote user, wherein the first telephone number is used to access the remote user at the corporate office, wherein the system includes:

at least one input for coupling to a transmission medium, wherein said at least one input receives communications from the user telephony communications device on the transmission medium;

a memory for storing identification information received from the user telephony communications device; and

a communication device coupled to the memory and to the at least one input for communicating voice and data information to the user telephony communications device on the transmission medium;

wherein the system is operable to perform a call forwarding operation to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said system;

wherein the system is operable to route said telephone calls made to said first telephone number and forwarded to said system to the user telephony communications device on the transmission medium;

wherein the system is operable to communicate telephony control information with the user telephony communications device on the transmission medium, wherein said telephony control information enables the user telephony communications device to behave as an extension to a telephony server at the corporate office; and

wherein the system is operable to perform said call forwarding operation and communicate said telephony control information in response to the system receiving a communication from the user telephony communications device and receiving said identification information from the user telephony communications device.

43. The system of claim 42,

wherein the system at the corporate office is operable to receive a telephone call intended for said first telephone number, wherein said telephone call is intended for the remote user operating the user telephony communications device; and

wherein the system is operable to route said telephone call to the user telephony communications device through the transmission medium in response to the system receiving said telephone call.

44. The system of claim 42,

wherein the system is operable to simultaneously communicate voice and data information to the user telephony communications device through the transmission medium.

45. The system of claim 42, wherein said system further includes:

processing logic for accessing said identification information received from the user telephony communications device; and

call forwarding logic for performing said call forwarding operation using said identification information.

46. The system of claim 42, wherein the system is operable to perform data transfers with the user telephony communications device through the transmission medium after the system receives a connection from the user telephony communications device.

47. The system of claim 46, wherein the system is operable to route electronic mails intended for the remote user to the user telephony communications device through the transmission medium after the system receives a connection from the user telephony communications device.

48. The system of claim 46, wherein the system is operable to route faxes intended for the remote user to the user telephony communications device through the transmission medium after the system receives a connection from the user telephony communications device.

49. The system of claim 42, wherein a local area network is located at the corporate office, wherein the system is coupled to the local area network;

wherein the system is operable to route local area network data intended for the remote user to the user telephony communications device through the transmission medium after the system receives a connection from the user telephony communications device.

50. The system of claim 42, wherein the user telephony communications device includes a second telephone number, wherein the second telephone number is used to access the user telephony communications device;

wherein the system is operable to perform a call forwarding operation to call forward telephone calls made to said second number to said system at the corporate office;

wherein the system is operable to route said telephone calls made to the second telephone number and forwarded to the system to the user telephony communications device through the transmission medium.

51. The system of claim 42, wherein the corporate office includes a corporate office telephone used by the remote user when the remote user is physically present in the corporate office;

wherein the user telephony communications device behaves substantially like said corporate office telephone in response to said telephony control information.

52. The system of claim 42,

wherein the corporate office further includes a plurality of telephones, wherein each of said plurality of telephones have a local extension;

wherein the user telephony communications device is operable to call a co-worker at the corporate office through the transmission medium by dialing a local extension of a telephone associated with said co-worker.

53. The system of claim **42**, wherein said telephony control information includes one or more of message indications, line indications, and LCD display information.

54. The system of claim **42**,

wherein, in response to the user telephony communications device disconnecting from the corporate office, the system performs a discontinue operation to discontinue said call forwarding operation;

wherein after said discontinue operation telephone calls made to said first telephone number which are intended for the user at the corporate office are received by a telephony device at the corporate office associated with said first telephone number.

55. The system of claim **42**, wherein the system is operable to perform said call forwarding operation by instructing the telephony server at the corporate office to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said system.

56. The system of claim **55**,

wherein, in response to the user telephony communications device disconnecting from the corporate office, the system is operable to instruct the telephony server at the corporate office to discontinue said call forwarding operation;

wherein, after the telephony server at the corporate office discontinues said call forwarding operation, telephone calls made to said first telephone number which are intended for the user at the corporate office are received by the telephony sever and not forwarded to the virtual presence server.

57. The system of claim **42**, wherein the system operates as the telephony server at the corporate office.

58. A method for providing a remote user operating a user telephony communications device with access capabilities to a corporate office, wherein the corporate office includes a virtual presence server, wherein the corporate office includes a first telephone number associated with the remote user, wherein the first telephone number is used to access the remote user at the corporate office, wherein the user telephony communications device includes a second telephone number, wherein the second telephone number is used to access the user telephony communications device, the method comprising:

the user telephony communications device connecting to the corporate office;

the user telephony communications device providing identification information to the virtual presence server at the corporate office, said identification information including an identity of the remote user operating the user telephony communications device;

the virtual presence server performing a call forwarding operation to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said virtual presence server;

performing a call forwarding operation to call forward telephone calls made to said second number to said virtual presence server;

wherein said telephone calls forwarded to the virtual presence server are routed through said virtual presence server to said user telephony communications device; and

wherein said call forwarding operations are performed in response to the user telephony communications device connecting to the corporate office and providing said identification information.

59. The method of claim **58**, wherein the virtual presence server performing said call forwarding operation to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said virtual presence server comprises the virtual presence server instructing a telephony server at the corporate office to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said virtual presence server.

60. The method of claim **58**,

wherein said performing a call forwarding operation to call forward telephone calls made to said second number to said virtual presence server comprises instructing a telephone company central office to forward telephone calls made to the second telephone number to the virtual presence server at the corporate office.

61. The method of claim **58**, further comprising:

the virtual presence server routing a telephone call made to said first telephone number and forwarded to said virtual presence server to the user telephony communications device.

62. The method of claim **58**, further comprising:

the virtual presence server receiving a telephone call made to said first telephone number and forwarded to said virtual presence server, wherein said telephone call is intended for the user operating said user telephony communications device; and

the virtual presence server routing said telephone call made to said first telephone number and forwarded to said virtual presence server to the user telephony communications device.

63. The method of claim **62**, further comprising:

the user telephony communications device and the virtual presence server communicating voice information after the virtual presence server routing said telephone call;

the virtual presence server performing data transfers with the user telephony communications device during the user telephony communications device and the virtual presence server communicating said voice information.

64. The method of claim **58**, further comprising:

a party making a telephone call to the second telephone number of the user telephony communications device;

wherein said telephone call to the second telephone number of the user telephony communications device is automatically forwarded to the virtual presence server at the corporate office;

the virtual presence server receiving said telephone call made to the second telephone number of the user telephony communications device and forwarded to the virtual presence server at the corporate office;

the virtual presence server routing said telephone call made to the second telephone number of the user telephony communications device and forwarded to the virtual presence server at the corporate office to the user telephony communications device.

65. The method of claim **58**, wherein said virtual presence server performing said call forwarding operations includes:

accessing said identification information received from said user telephony communications device; and

performing said call forwarding operations using said identification information.

66. The method of claim 58, further comprising:

the virtual presence server performing data transfers with the user telephony communications device after the user telephony communications device connecting to the corporate office.

67. The method of claim 66, further comprising:

the virtual presence server routing electronic mail intended for the remote user to the user telephony communications device after the user telephony communications device connecting to the corporate office.

68. The method of claim 66, further comprising:

the virtual presence server routing faxes intended for the remote user to the user telephony communications device after the user telephony communications device connecting to the corporate office.

69. The method of claim 58, wherein the corporate office includes a local area network, wherein the virtual presence server is coupled to the local area network, the method further comprising:

the virtual presence server routing local area network data intended for the remote user to the user telephony communications device after the user telephony communications device connecting to the corporate office.

70. The method of claim 58, wherein the corporate office includes a telephony server, the method further comprising:

the virtual presence server communicating telephony control information with the user telephony communications device, wherein said communicating telephony control information enables the user telephony communications device to behave as an extension to the telephony server at the corporate office.

71. The method of claim 70, wherein the virtual presence server communicates said telephony control information with the user telephony communications device in response to the user telephony communications device connecting to the corporate office and providing said identification information.

72. The method of claim 70, wherein the corporate office includes a corporate office telephone coupled to the telephony server and used by the remote user when the remote user is physically present in the corporate office;

wherein the user telephony communications device behaves substantially like said corporate office telephone in response to the virtual presence server communicating said telephony control information with the user telephony communications device.

73. The method of claim 70, further comprising:

the remote user calling a party after said connecting and after the virtual presence server communicates telephony control information with said user telephony communications device, wherein said calling includes the user telephony communications device using said telephony control information to behave as an extension to the telephony server.

74. The method of claim 70, wherein the corporate office further includes a plurality of telephones coupled to said telephony server, wherein each of said plurality of telephones coupled to said telephony server have a local extension, the method further comprising:

the remote user calling a co-worker at the corporate office after said connecting and after the virtual presence server communicates telephony control information with the user telephony communications device, wherein said calling the co-worker includes the remote user dialing a local extension of a telephone associated with said co-worker.

75. The method of claim 70, wherein said telephony control information includes one or more of message indications, line indications, and LCD display information.

76. The method of claim 58, further comprising:

the user telephony communications device disconnecting from the corporate office;

the virtual presence server performing one or more discontinue operations to discontinue said call forwarding operations in response to said disconnecting;

wherein after said discontinue operations telephone calls made to said first telephone number which are intended for the user at the corporate office are received by a telephony device at the corporate office associated with said first telephone number, and telephone calls made to said second telephone number which are intended for the user telephony communications device are received by the user telephony communications device.

77. The method of claim 76, wherein said discontinue operations comprise instructing a telephony server at the corporate office to discontinue forwarding telephone calls made to said first telephone number which are intended for the user at the corporate office to said virtual presence server and instructing a telephone company central office to discontinue forwarding telephone calls made to the second telephone number to the virtual presence server at the corporate office.

78. A system which provides a remote user with access capabilities to a corporate office, wherein the system is located at the corporate office, wherein the remote user operates a user telephony communications device physically located remotely from the corporate office, wherein the corporate office includes a first telephone number associated with the remote user, wherein the first telephone number is used to access the remote user at the corporate office, wherein the user telephony communications device includes a second telephone number, wherein the second telephone number is used to access the user telephony communications device, wherein the system includes:

at least one input for coupling to a transmission medium, wherein said at least one input receives communications from the user telephony communications device;

a memory for storing identification information received from the user telephony communications device; and

a communication device coupled to the memory and to the at least one input for communicating with the user telephony communications device;

wherein the system is operable to perform a call forwarding operation to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said system;

wherein the system is operable to perform a call forwarding operation to call forward telephone calls made to said second number to said system;

wherein said telephone calls forwarded to the system are routed through said system to said user telephony communications device; and

wherein the system performs said call forwarding operations in response to the user telephony communications device connecting to the corporate office and providing said identification information.

79. The system of claim 78, wherein said call forwarding operation to forward telephone calls made to said first telephone number which are intended for the user at the corporate office to said system comprises instructing a telephony server at the corporate office to forward telephone

calls made to said first telephone number which are intended for the user at the corporate office to said system.

80. The system of claim **78**,

wherein said call forwarding operation to call forward telephone calls made to said second number to said system comprises instructing a telephone company central office to forward telephone calls made to the second telephone number to the system.

81. The system of claim **78**,

wherein the system at the corporate office is operable to receive a telephone call intended for said first telephone number, wherein said telephone call is intended for the remote user operating the user telephony communications device; and

wherein the system is operable to route said telephone call to the user telephony communications device in response to the system receiving said telephone call.

82. The system of claim **78**,

wherein, in response to a party making a telephone call to the second telephone number of the user telephony communications device, said telephone call to the second telephone number of the user telephony communications device is automatically forwarded to the system at the corporate office;

wherein the system is operable to receive said telephone call made to the second telephone number of the user telephony communications device and forwarded to the system at the corporate office;

wherein the system is operable to route said telephone call made to the second telephone number of the user telephony communications device and forwarded to the system at the corporate office to the user telephony communications device.

83. The system of claim **78**, wherein said system further includes:

processing logic for accessing said identification information received from the user telephony communications device; and

call forwarding logic for performing said call forwarding operation using said identification information.

84. The system of claim **78**, wherein the system is operable to perform data transfers with the user telephony communications device after the system receives a connection from the user telephony communications device.

85. The system of claim **84**, wherein the system is operable to route electronic mails intended for the remote user to the user telephony communications device after the system receives a connection from the user telephony communications device.

86. The system of claim **84**, wherein the system is operable to route faxes intended for the remote user to the user telephony communications device after the system receives a connection from the user telephony communications device.

87. The system of claim **78**, wherein a local area network is located at the corporate office, wherein the system is coupled to the local area network;

wherein the system is operable to route local area network data intended for the remote user to the user telephony communications device after the system receives a connection from the user telephony communications device.

88. The system of claim **78**,

wherein the system is operable to communicate telephony control information with the user telephony communications device, wherein said telephony control information enables the user telephony communications device to behave as an extension to a telephony server at the corporate office.

89. The system of claim **88**, wherein the system is operable to communicate said telephony control information with the user telephony communications device in response to the system receiving a communication from the user telephony communications device and receiving said identification information from the user telephony communications device.

90. A method for providing a remote user operating a user telephony communications device with access capabilities to a corporate office, wherein the corporate office includes a virtual presence server, the method comprising:

the user telephony communications device connecting to the corporate office on a communication line and providing identification information; and

the virtual presence server communicating telephony control information with the user telephony communications device on the communication line, wherein said communicating telephony control information enables the user telephony communications device to behave as an extension to a telephony server at the corporate office;

wherein the virtual presence server communicates said telephony control information on the communication line in response to the user telephony communications device connecting to the corporate office and providing said identification information.

91. The method of claim **90**, wherein the corporate office includes a corporate office telephone coupled to the telephony server and used by the remote user when the remote user is physically present in the corporate office;

wherein the user telephony communications device behaves substantially like said corporate office telephone in response to the virtual presence server communicating said telephony control information with the user telephony communications device.

92. The method of claim **90**, further comprising:

the remote user calling a party after said connecting and after the virtual presence server communicates telephony control information with said user telephony communications device, wherein said calling includes the user telephony communications device using said telephony control information to behave as an extension to the telephony server.

93. The method of claim **90**, wherein the corporate office further includes a plurality of telephones coupled to said telephony server, wherein each of said plurality of telephones coupled to said telephony server have a local extension, the method further comprising:

the remote user calling a co-worker at the corporate office after said connecting and after the virtual presence server communicates telephony control information with the user telephony communications device, wherein said calling the co-worker includes the remote user dialing a local extension of a telephone associated with said co-worker.

94. The method of claim **90**, wherein said telephony control information includes one or more of message indications, line indications, and LCD display information.

95. The method of claim 90, wherein the corporate office includes a first telephone number associated with the remote user and used to access the remote user at the corporate office;

wherein calls made to said first telephone number which are intended for the user at the corporate office are automatically routed on the communication line to the user telephony communications device.

96. The method of claim 95, further comprising:

the corporate office receiving a telephone call made to said first telephone number, wherein said telephone call is intended for the remote user operating said user telephony communications device; and

automatically routing said telephone call made to said first telephone number to the user telephony communications device on the communication line, wherein said automatically routing is performed in response to the user telephony communications device connecting to the corporate office and providing said identification information.

97. The method of claim 96, further comprising:

the user telephony communications device and the virtual presence server communicating voice information on the communication line after said automatically routing said telephone call;

the virtual presence server performing data transfers with the use telephony communications device on the communication line during the user telephony communications device and the virtual presence server communicating said voice information.

98. The method of claim 96, wherein the virtual presence server communicates voice and telephony control information with the user telephony communications device on the communication line.

99. The method of claim 96, wherein the virtual presence server communicates voice, data and telephony control information with the user telephony communications device on the communication line.

* * * * *

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Borst et al.

(10) **Patent No.: US 6,366,668 B1**
(45) **Date of Patent: Apr. 2, 2002**

(54) **METHOD OF ROUTING CALLS IN AN AUTOMATIC CALL DISTRIBUTION NETWORK**

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(73) Assignee: **Avaya Technology Corp.**, Basking Ridge, NJ (US)

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(21) Appl. No.: **09/266,283**

(22) Filed: **Mar. 11, 1999**

(51) **Int. Cl.**[7] **H04M 3/00**

(52) **U.S. Cl.** **379/266.04**; 379/265.11; 379/221.01

(58) **Field of Search** 379/265, 266, 379/309, 201, 209, 221

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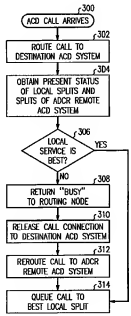
Primary Examiner—Creighton Smith
(74) *Attorney, Agent, or Firm*—David Volejnicek

(57) **ABSTRACT**

The alternate destination redirection (ADR) feature (**102**) of telephone switching systems (**101**) or an equivalent is used to implement a "post-route" routing architecture having the benefits of a "pre-route" routing architecture in a network ACD (FIG. 1). The ADR feature is administered in the network (**100**) for individual ACD systems and individual call types at each ACD system to identify another ACD system as an alternative destination for calls of the individual call type rejected by the individual ACD system. The network distributes (**302**) calls to the plurality of ACD systems (**110–112**) on a basis (e.g., fixed percentage, round-robin) that does not require the network to know the status of the individual ACD systems. Upon having a call of an individual type routed thereto, an individual ACD system checks (**304**) the status of the ACD system that is administered as the alternative destination for its rejected calls of the individual type. If it determines that it can provide the better service, the individual ACD system services (**314**) the call. If it determines that the alternative destination ACD system can provide the better service, the individual ACD system rejects (**308**) the call, whereupon the network, operating under influence of the ADR feature, releases (**310**) the connection of the call to the individual ACD system and reroutes (**312**) the call to the alternative destination ACD system.

21 Claims, 6 Drawing Sheets



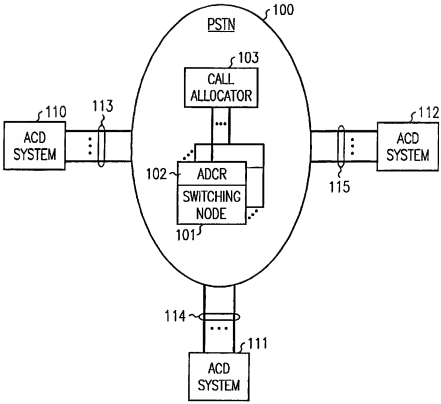


FIG. 1

ADCR 102

202 ACD SYSTEM	203 CALL TYPE (DNIS)	204 FORWARDING #
.	.	.
.	.	.
.	.	.

FIG. 2

FIG. 3

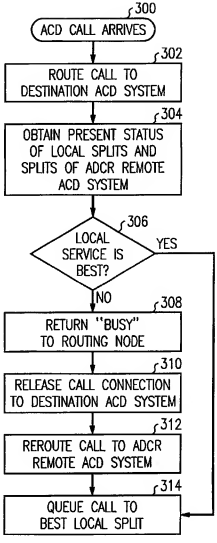
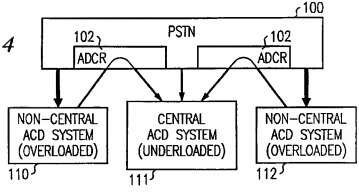

300
ACD CALL ARRIVES
302
ROUTE CALL TO DESTINATION ACD SYSTEM
304
OBTAIN PRESENT STATUS OF LOCAL SPLITS AND SPLITS OF ADCR REMOTE ACD SYSTEM
306
LOCAL SERVICE IS BEST?
YES
NO
308
RETURN "BUSY" TO ROUTING NODE
310
RELEASE CALL CONNECTION TO DESTINATION ACD SYSTEM
312
REROUTE CALL TO ADCR REMOTE ACD SYSTEM
314
QUEUE CALL TO BEST LOCAL SPLIT

FIG. 4


100
PSTN
102
ADCR
102
ADCR
NON-CENTRAL ACD SYSTEM (OVERLOADED)
110
CENTRAL ACD SYSTEM (UNDERLOADED)
111
NON-CENTRAL ACD SYSTEM (OVERLOADED)
112

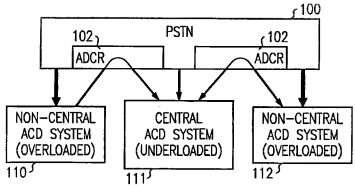


FIG. 5

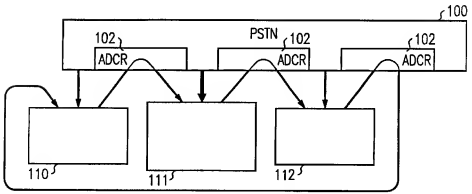


FIG. 6

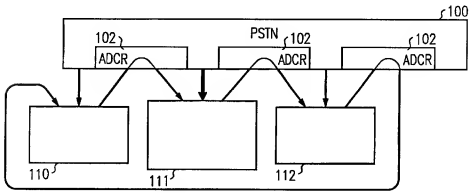


FIG. 7

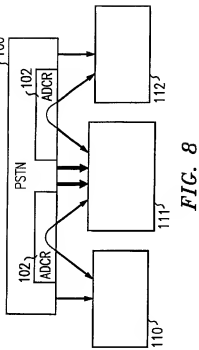

100
PSTN
102
ADCR
110
111
112

FIG. 8

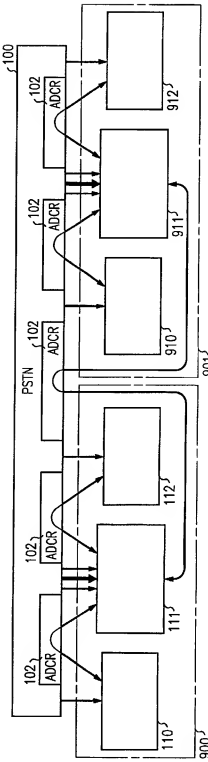

100
PSTN
102
ADCR
110
111
112
900
901
910
911
912

FIG. 9

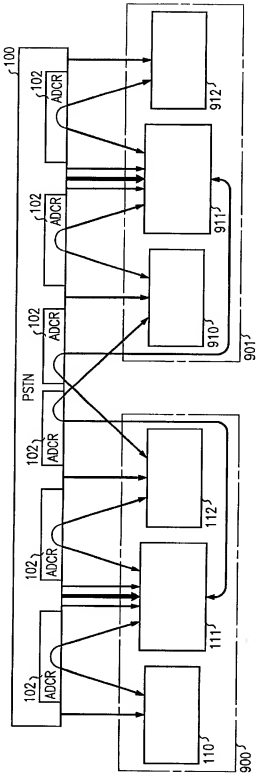


FIG. 10

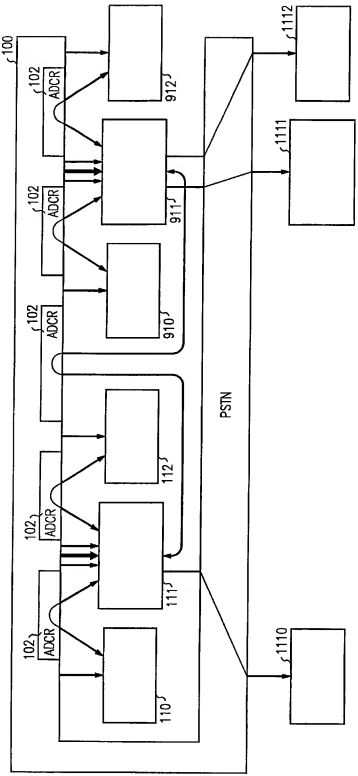


FIG. 11

METHOD OF ROUTING CALLS IN AN AUTOMATIC CALL DISTRIBUTION NETWORK

TECHNICAL FIELD

This invention pertains generally to automatic call distribution (ACD) systems, also known as call centers or telemarketing systems, and specifically to the routing of calls among such systems in a network of such systems.

BACKGROUND OF THE INVENTION

"Network ACD" refers to a plurality of ACD systems that are **10** interconnected with each other (networked) by a—typically the public telephone—communications network. There are two main types of network ACD routing architectures in use. One is a "pre-route" or "network-route" architecture, which makes routing decisions while the call is still in the interconnecting (e.g., public telephone) network. With this architecture, it is difficult for the routing node to obtain timely information on the status of the individual ACDs in order to make a good routing decision. However, this architecture has the advantage that it does not use telecommunications links (e.g., telephony trunks) to route a call to the destination ACD beyond those that would be used to complete a regular, non-ACD, call. The other architecture is a "post-route" or "premises-route" architecture, which makes routing decisions after the call has been delivered to an ACD system. With this architecture, very high-quality routing decisions can be made by the receiving ACD. Unfortunately, the re-routing of the call to different ACDs in the network requires the use of additional communications links—those required to connect the call from the receiving ACD to the destination ACD. This use of additional network resources to complete the call is undesirable. The ideal solution would be to make high-quality routing decisions without the need to use additional network resources for routing the call.

SUMMARY OF THE INVENTION

This invention is directed to solving these and other problems and disadvantages of the prior art. Illustratively according to the invention, the alternate destination redirection (ADR) feature of telephone switching systems (also known as the alternate destination call redirection, or ADCR) or an equivalent is used to implement a "post-route" routing architecture having the benefits of a "pre-route" routing architecture in a network ACD. The ADR feature is administered in the network, for individual ACD systems and individual call types at each ACD system, to identify another ACD system as the alternative destination for calls of the individual call type rejected by the individual ACD system. The network distributes calls to the plurality of ACD systems on a basis (e.g., fixed percentage, round-robin) that does not require the network to know the status of the individual ACD systems. Upon having a call of an individual type routed thereto, an individual ACD system checks the status of the ACD system that is administered as the alternative destination for its rejected calls of the individual type. If it determines that it can provide the better service, the individual ACD system services the call. If it determines that the alternative destination ACD system can provide the better service, the individual ACD system rejects the call, whereupon the network, operating under influence of the ADR feature, releases the connection of the call to the individual ACD system and reroutes the call to the alternative destination ACD system.

Generally according to the invention, routing of communications to ACD systems in a network of a plurality of ACD systems interconnected by a communications network is effected as follows. The communications network routes a communication to a selected one of the plurality of ACD systems. In response to having the communication routed thereto, the selected ACD system determines whether or not it will service the communication, by checking the status of the other ACD system and determining therefrom whether it or the other ACD system can provide better service to the communication. In response to determining that it will not service the communication, the selected ACD system sends a rejection (e.g., a "busy" indication) to the communications network. In the communications network, the other ACD system is identified (e.g., administered in the ADR feature or the equivalent) as the alternative destination for the communication rejected by the selected ACD system. Therefore, in response to receiving the rejection, the communications network releases a connection of the communication to the selected ACD system and reroutes the communication to the other ACD system.

The invention incorporates the advantages of both pre-route and post-route architectures without the disadvantages of each. That is, it makes high-quality routing decisions without the need for additional trunking. It is also lower in cost than both traditional types of network ACD routing architectures: it does not have the capital costs for network servers and gateways that are incurred with pre-route architectures, and it does not have the extra trunking costs incurred by post-route architectures. Furthermore, for ACD systems that already have the capability to determine the status of other ACD systems, it requires no hardware changes or software development to implement—proper administration of the ACD systems and of the network is all that is required.

These and other advantages and features of the invention will become more apparent from the following description of an illustrative embodiment of the invention considered together with the drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a block diagram of a network ACD that includes an illustrative embodiment of the invention;

FIG. **2** is a block diagram of data entries of an ADR feature of a switching node of the network ACD of FIG. **1**;

FIG. **3** is a functional flow diagram of operations performed by the network ACD of FIG. **1** to route a call to an appropriate ACD system; and

FIGS. **4–11** are each a block diagram of an alternative embodiment of the invention in the network ACD of FIG. **1**.

DETAILED DESCRIPTION

FIG. **1** shows an illustrative network ACD which comprises a plurality of ACD systems **110–112** interconnected (networked) with each other and with calling and/or called parties via the public switched telephone network (PSTN) **100**, the Internet, or some other communications network. Illustratively, ACD systems **110–112** are connected to PSTN **100** via trunks **113–115**, which preferably are ISDN trunks. PSTN **100** includes one or more conventional switching nodes **101** for routing communications (e.g., calls) to their destinations, which in this case are the ACD systems **110–112**. PSTN **100** further includes a conventional call allocator **103**, which is a stored-program-controlled machine that tells switching nodes **101** which ACD calls to route to which one of ACD systems **110–112**.

Switching nodes **101** of PSTN **100** conventionally provide the Alternate Destination Redirection (ADR) feature **102**, or an equivalent. As shown in FIG. **2**, this feature allows a single forwarding number **204** to be administered in a switching node **101** for each call type (e.g., called number, or DNIS) **203** for each ACD system **110**–**112** served by that switching node **101**. When a switching node **101** delivers a call to the destination identified by the called number and the destination replies with a "busy", the switching node **101** releases the call connection to the destination and reroutes the call to the call type's (called number's) **5** forwarding number specified for that destination.

According to the invention, the ADR feature **102** or an equivalent is used to achieve the advantages of both pre-route and post-route network ACD architectures without suffering the disadvantages of either architecture. This is illustratively accomplished as follows. Call allocator **103** is administered to operate without obtaining status information from ACD systems **110**–**112**, and to simply route a percentage of calls of each call type to each ACD system **110**–**112**. One of the ACD systems **110**–**112**, generally the one with the greatest number of agents for handling calls of a call type, is denoted as a "central" ACD system **111** for that call type, and call allocator **103** is administered to deliberately underload the central ACD system **111** and to overload the other ACD systems **110** and **112** with calls of this type. As a result, there will be a constant need to redirect a small percentage of calls of this type from each non-central, or primary, ACD system **110** and **112** to the central, or backup, ACD system **111** in order to maintain an even load-balance across the network. This redirection is provided by the ADR feature **102**, which is administered for each call type (e.g., each DNIS) for each non-central ACD system to redirect calls of that type to the central ACD system. When a call of a particular type is routed to the central ACD system for that call type, the call is simply queued to the appropriate split. But, as shown in FIG. **3**, when a call of that type arrives, at step **300**, and is routed to a non-central ACD system for that call type, at step **302**, a post-route arrangement (such as is described in U.S. Pat. No. 5,754,639, for example) is used by that non-central ACD system to compare the status of its splits with the status of the splits of the central ACD system, at step **304**. If the non-central ACD system can offer a better service than the central ACD system, as determined at step **306**, the call is simply queued to the appropriate split and is serviced at the non-central ACD system, at step **314**. If the central ACD system can offer a better service than this non-central ACD system, as determined at step **306**, a rejection (e.g., a "busy" signal) is immediately returned by the non-central ACD system to a switching node **101**, at step **308**, which triggers the ADR feature **102**. This feature causes switching node **101** to release the call connection to this non-central ACD system, at step **310**, and to reroute the call to the designated alternate destination, which in this example is the central ACD system, at step **312**. At the central ACD system, the rerouted call is queued to the appropriate split, at step **314**. The just-described embodiment of the invention is shown for one call type in FIG. **4**.

Alternatively, the central ACD system **111** may function just like one of the non-central ACD systems **110** and **112** as shown in FIG. **3**, by comparing its service quality with and forwarding its excess calls to one—typically the largest one—of the non-central ACD systems **110** and **112**. This alternative is shown for one call type in FIG. **5**.

Another alternative embodiment, found to be particularly useful when all ACD systems **110**–**112** are of approximately the same size, eliminates the concept of a central ACD system and treats all ACD systems equally, as non-central ACD systems connected in a ring. Call allocator **103** is programmed to perform round-robin routing of calls to ACD systems **110**–**112**, whereby they are all equally loaded with calls, and the ADR feature **102** of switching nodes **101** and the post-route arrangements of the ACD systems **110**–**112** are administered such that each ACD system **110**–**112** compares its service against, and forwards excess calls to, a different one of the other ACD systems **110**–**112**. This embodiment is shown for one call type in FIG. **6**.

Yet another alternative embodiment causes calls of the same type that are being routed to a primary ACD system **111** to be delivered to that ACD system **111** in multiple streams (e.g., to different DNISs), and primary ACD system **111** has a different one of ACD system **110** and **112** administered in ADR feature **102** of switching node **101** as the backup system for each of the multiple streams. This embodiment is shown for one call type in FIG. **7**.

Not all of the streams need be of the same size (the same number of calls.) For example, the streams may be sized proportionally to the relative sizes of the backup ACD systems for the corresponding streams. Also, not all of the ACD systems need employ multiple streams; for example, only one of the ACD systems **111** may employ multiple streams while each of the other ACD systems **110** and **112** employs a single stream for each call type. This variant is shown for one call type in FIG. **8**.

The described architecture is extendable to network ACDs with large numbers of ACD systems **110**–**112** and **910**–**912** where the network ACD is divided into a plurality of sub-networks **900** and **901**, each with its own central ACD system **111** and **911**, respectively. Call loads are balanced across the sub-networks **900** and **901** by connecting each central ACD system **111**, **911** to the other ACD systems **110** and **112**, **910** and **912**, respectively, in its sub-system **900**, **901**, respectively, in the manner shown in one of the FIGS. **4**–**8**, and by connecting together the two central ACD systems **111** and **911** to compare their service with, and to route excess calls to, one another. This embodiment is shown for one call type in FIG. **9**.

A variation on the embodiment of FIG. **9** involves the two central ACD systems **111** and **911** comparing their service with, and routing excess calls to, one of the non-central ACD systems **912** and **110**, respectively, of the other sub-system. This variation is shown for one call type in FIG. **10**.

In a network ACD comprising ACD systems of greatly varying sizes, including very small ACD systems **1110**–**1112** where accurate service predictions are difficult, the look-ahead interflow (LAI) of ACD systems such as the Lucent Definity® ACD system may be used to deliver calls to the very small ACD systems **1110**–**1112**. This configuration is an extension of the configuration of FIG. **9**, and is shown in FIG. **11**. The small ACD systems **1110**–**1112** do not receive incoming calls directly from the network **100**; rather, calls are redirected from central ACD systems **111** and **911** to the small ACD systems **1110**–**1112** using LAI when an agent becomes available at the small ACD systems **1110**–**1112**. Although the calls redirected to the small ACD systems **1110**–**1112** via LAI do require additional call trunks, this accounts for a very small percentage of the total number of calls.

Of course, various changes and modifications to the illustrative embodiments described above will be apparent to those skilled in the art. For example, instead of receiving status-indicative messages from a backup ACD system, a primary ACD system may merely check whether the backup

ACD system is presenting a "busy" indication to arriving calls, and use this as the criterion for determining whether it or the backup ACD system can provide the better service. Such changes and modifications can be made without departing from the spirit and the scope of the invention and without diminishing its attendant advantages. It is therefore intended that such changes and modifications be covered by the following claims except insofar as limited by the prior art.

What is claimed is:

1. A method of routing communications to ACD systems in a network of a plurality of ACD systems interconnected by a communications network, comprising:

the communications network routing a first communication to a selected one of the plurality of ACD systems;

in response to having the communication routed thereto, the selected ACD system checking status of another one of the plurality of ACD systems to determine whether or not the selected ACD system will service the first communication;

in response to determining that the selected ACD system will not service the first communication, the selected ACD system sending a rejection to the communications network;

in response to receiving the rejection, the communications network releasing a connection of the first communication to the selected ACD system; and

further in response to receiving the rejection, the communications network rerouting the first communication to the other ACD system, which is identified in the communications network as an alternative destination for the first communication rejected by the selected ACD system.

2. The method of claim 1 wherein:

checking status comprises

determining from the status which one of the selected ACD system and the other ACD system can provide better service to the communication.

3. The method of claim 1 wherein:

checking status comprises

receiving a status-indicative message from the other ACD system.

4. The method of claim 1 wherein:

checking status comprises

determining whether the other ACD system is presenting a busy indication to communications.

5. The method of claim 1 wherein:

the communications network routes a first plurality of communications to the selected ACD system which overloads the selected ACD system, and routes a second plurality of communications to the other ACD system which underloads the other ACD system, so that the other ACD system has capacity to service communications rerouted thereto from the selected ACD system.

6. The method of claim 1 wherein:

the first communication is of a first type; and

the method further comprises

the communications network routing a second communication, of a second type, to the selected ACD system,

in response to having the second communication routed thereto, the selected ACD system checking status of a third one of the plurality of ACD systems to determine whether or not the selected ACD system will service the second communication,

in response to determining that the selected ACD system will not service the second communication, the selected ACD system sending a rejection of the second communication to the communications network,

in response to receiving the rejection of the second communication, the communications network releasing a connection of the second communication to the selected ACD system, and

further in response to receiving the rejection of the second communication, the communications network rerouting the second communication to the third ACD system, which is identified in the communications network as an alternative destination for communications of the second type rejected by the selected ACD system.

7. The method of claim 6 further comprising:

administering the communications network to indicate, for each type of communications, an alternative destination ACD system for servicing communications of that type rejected by the selected ACD system.

8. The method of claim 7 wherein:

administering comprises

administering an alternate destination redirection (ADR) feature, or an equivalent, of a switching system of the communications network.

9. The method of claim 8 wherein:

sending a rejection comprises

sending a busy indication.

10. The method of claim 6 further comprising:

the communications network routing some communications, including a third communication of the first type and a fourth communication of the second type, to the other ACD system, and routing other communications, including a fifth communication of the first type and a sixth communication of the second type, to the third ACD system;

in response to having the third or the fourth communication routed thereto, the other ACD system determining whether or not the other ACD system will service the third or the fourth communication;

in response to determining that the other ACD system will not service the third or the fourth communication, the other ACD system sending a rejection of the third or the fourth communication to the communications network;

in response to having the fifth or the sixth communication routed thereto, the third ACD system determining whether or not the third ACD system will service the fifth or the sixth communication;

in response to determining that the third ACD system will not service the fifth or the sixth communication, the third ACD system sending a rejection of the fifth or the sixth communication to the communications network;

in response to receiving any one of the rejections from the second or the third ACD, the communications network releasing a connection of the rejected communication to the ACD system to which the connection connects;

further in response to receiving the rejection of the third or the fifth communication, the communications network rerouting the third or the fifth communication to the selected ACD system, which is identified in the communications network as an alternative destination for communications of the first type rejected by the other ACD system and by the third ACD system;

further in response to receiving the rejection of the fourth communication, the communications network rerout-

ing the fourth communication to the third ACD system, which is identified in the communications network as an alternative destination for communications of the second type rejected by the other ACD system; and

further in response to receiving the rejection of the sixth communication, the communications network rerouting the sixth communication to the other ACD system, which is identified in the communications network as an alternative destination for communications of the second type rejected by the third ACD system.

11. The method of claim 1 wherein:

determining comprises

the selected ACD system obtaining information from the other ACD system regarding service that the communication would receive at the other ACD system,

comparing the service that the communication would receive at the other ACD system with service that the communication would receive at the selected ACD system, and

in response to determining that the communication would receive better service at the other ACD system, sending the rejection to the communications network.

12. The method of claim 1 further comprising:

the communications network routing a second communication to the other ACD system and routing a third communication to a third one of the plurality of ACD systems;

in response to having the third communication routed thereto, the third ACD system determining whether or not the third ACD system will service the third communication;

in response to determining that the third ACD system will not service the third communication, the third ACD system sending a rejection of the third communication to the communications network;

in response to receiving the rejection of the third communication, the communications network releasing a connection of the third communication to the third ACD system;

further in response to receiving the rejection of the third communication, the communications network rerouting the third communication to the other ACD system, which is identified in the communications network as an alternative destination for the third communication rejected by the third ACD system; and

in response to having the second communication routed thereto and having the first and the third communications rerouted thereto, the other ACD system servicing the first, the second, and the third communications.

13. The method of claim 12 wherein:

the communications network routes a first stream of first communications to the selected ACD system which overloads the selected ACD system, routes a second stream of second communications to the other ACD system which underloads the other ACD system, and routes a third stream of third communications to the third ACD system which overloads the third ACD system.

14. The method of claim 12 further comprising:

the communications network routing a fourth communication to the other ACD system;

in response to having the fourth communication routed thereto, the other ACD system determining whether or not the other ACD system will service the fourth communication;

in response to determining that the other ACD system will not service the fourth communication, the other ACD system sending a rejection of the fourth communication to the communications network;

in response to receiving the rejection of the fourth communication, the communications network releasing a connection of the fourth communication to the other ACD system; and

further in response to receiving the rejection of the fourth communication, the communications network rerouting the fourth communication to the selected ACD system, which is identified in the communications network as an alternative destination for the fourth communication rejected by the other ACD system.

15. The method of claim 14 further comprising:

the communications network routing a fifth communication to the other ACD system;

in response to having the fifth communication routed thereto, the other ACD system determining whether or not the other ACD system will service the fifth communication;

in response to determining that the other ACD system will not service the fifth communication, the ACD system sending a rejection of the fifth communication to the communications network;

in response to receiving the rejection of the fifth communication, the communications network releasing a connection of the fifth communication to the other ACD system; and

further in response to receiving the rejection of the fifth communication, the communications network rerouting the fifth communication to the third ACD system, which is identified in the communications network as an alternative destination for the fifth communication rejected by the other ACD system.

16. The method of claim 15 wherein:

the communications network routes a stream of fourth communications and a stream of fifth communications to the other ACD system and relative sizes of the streams of fourth and fifth communications are proportional to relative capacities of the selected and the third ACD systems to service communications.

17. The method of claim 1 further comprising:

the communications network routing a second communication to the other ACD system and routing a third communication to a third one of the plurality of ACD systems;

in response to having the third communication routed thereto, the third ACD system determining whether or not the third ACD system will service the third communication;

in response to determining that the third ACD system will not service the third communication, the third ACD system sending a rejection of the third communication to the communications network;

in response to receiving the rejection of the third communication, the communications network releasing a connection of the third communication to the third ACD system;

further in response to receiving the rejection of the third communication, the communications network rerouting the third communication to the other ACD system, which is identified in the communications network as an alternative destination for the third communication rejected by the third ACD system;

in response to having the second communication routed thereto, the other ACD system determining whether or not the other ACD system will service the second communication;

in response to determining that the other ACD system will not service the second communication, the other ACD system sending a rejection of the second communication to the communications network;

in response to receiving the rejection of the second communication, the communications network releasing a connection of the second communication to the other ACD system;

further in response to receiving the rejection of the second communication, the communications network rerouting the second communication to the third ACD system, which is identified in the communications network as an alternative destination for the second communication rejected by the other ACD system.

18. The method of claim **1** further comprising:

the communications network routing a second communication to the other ACD system and routing a third communication to a third one of the plurality of ACD systems;

in response to having the second communication routed thereto, the other ACD system determining whether or not the other ACD system will service the second communication;

in response to determining that the other ACD system will not service the one communication, the other ACD system sending a rejection of the second communication to the communications network;

in response to receiving the rejection of the second communication, the communications network releasing a connection of the second communication to the other ACD system;

further in response to receiving the rejection of the second communication, the communications network rerouting the second communication to the third ACD system, which is identified in the communications network as an alternative destination for the second communication rejected by the other ACD system;

in response to having the third communication routed thereto, the third ACD system determining whether or not the third ACD system will service the third communication;

in response to determining that the third ACD system will not service the third communication, the third ACD system sending a rejection of the third communication to the communications network;

in response to receiving the rejection of the third communication, the communications network releasing a connection of the third communication to the third ACD system; and

further in response to receiving the rejection of the third communication, the communications network rerouting the third communication to the selected ACD system, which is identified in the communications network as an alternative destination for the third communication rejected by the third ACD system.

19. The method of claim **1** further comprising:

the communications network routing a second communication of a first type and a third communication of a second type to the other ACD system, and routing a fourth communication to a third one of the plurality of ACD systems;

in response to having the second or the third communication routed thereto, the other ACD system determining whether or not the other ACD system will service the second or the third communication;

in response to determining that the other ACD system will not service the second or the third communication, the other ACD system sending a rejection of the second or the third communication to the communications network;

in response to having the fourth communication routed thereto, the third ACD system determining whether or not the third ACD system will service the fourth communication;

in response to determining that the third ACD system will not service the fourth communication, the third ACD system sending a rejection of the fourth communication to the communications network;

in response to receiving the rejection of the second, the third, or the fourth communication, the communications network releasing a connection of the rejected communication to the ACD system to which the connection connects;

further in response to receiving the rejection of the second communication, the communications network rerouting the second communication to the selected ACD system, which is identified in the communications network as an alternative destination for communications of the first type rejected by the other ACD system;

further in response to receiving the rejection of the third communication, the communications network rerouting the third communication to the third ACD system, which is identified in the communications network as an alternative destination for communications of the second type rejected by the other ACD system; and

further in response to receiving the rejection of the fourth communication, the communications network rerouting the fourth communication to the other ACD system, which is identified in the communications network as an alternative destination for communications rejected by the third ACD system.

20. The method of claim **1** further comprising:

the communications network routing individual communications to different ones of a first plurality of the ACD systems that includes the selected and the other ACD systems;

in response to having an individual communication routed thereto, an individual ACD system of the first plurality determining whether or not the individual ACD system will service the individual communication;

in response to determining that the individual ACD system will not service the individual communication, the individual ACD system sending a rejection to the communications network;

in response to receiving a rejection of an individual communication from an individual ACD system, the communications network releasing a connection of the individual communication from the individual ACD system; and

further in response to receiving the rejection of the individual communication from the individual ACD system, the communications network rerouting the individual communication to a particular one of the first plurality of ACD systems which is identified in the communications network as an alternative destination for the individual communication rejected by the individual ACD system.

21. The method of claim 20 wherein:

routing individual communications comprises

the communications network routing individual communications, including a communication of a first type and a communication of a second type, to the other ACD system; and

rerouting the individual communication comprises

further in response to receiving the rejection of the individual communication from the individual ACD system of the first plurality, other than the rejection of the communication of the second type from the other ACD system, the communications network rerouting the individual communication, other than the communication of the second type, to a particular one of the first plurality of ACD systems which is identified in the communications network as an alternative destination for the individual communication rejected by the individual ACD system of the first plurality, other than for the communication of the second type rejected by the other ACD system, and

further in response to receiving the rejection of the individual communication of the second type from the other ACD system, the communications network rerouting the individual communication of the second type to a particular one of a second plurality of ACD systems that excludes the first plurality, which is identified in the communications network as an alternative destination for the individual communication of the second type rejected by the other ACD system; and

the method further comprises

the communications network routing individual communications to different ones of the second plurality of the ACD systems, including routing a communication of the first type and a communication of the second type to a third ACD system of the second plurality,

in response to having an individual communication routed thereto, an individual ACD system of the second plurality determining whether or not the individual ACD system will service the individual communication,

in response to determining that the individual ACD system will not service the individual communication, the individual ACD system of the second plurality sending a rejection to the communications network,

in response to receiving a rejection of an individual communication from an individual ACD system of the second plurality, the communications network releasing a connection of the individual communication to the individual ACD system of the second plurality,

further in response to receiving the rejection of the individual communication from the individual ACD system of the second plurality, other than the rejection of the communication of the second type from the third ACD system, the communications network rerouting the individual communication, other than the communication of the second type, to a particular one of the second plurality of ACD systems which is identified in the communications network as an alternative destination for the individual communication rejected by the individual ACD system of the second plurality, other than for the communication of the second type rejected by the third ACD system, and

further in response to receiving the rejection of the individual communication of the second type from the third ACD system, the communications network rerouting the individual communication of the second type to a particular one of the first plurality of ACD systems which is identified in the communications network as an alternative destination for the individual communication of the second type rejected by the third ACD system.

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